Shoulder Injuries in the Industrial Athlete

New Frontiers: Transition Support and Achieving Mission Success

2009 NASA Occupational Health Meeting

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Shoulder Injuries in the Industrial Athlete

Objectives

- Locate important anatomic landmarks
- Know important history questions to assist in the evaluation of shoulder injuries
- Perform an appropriate shoulder exam
- Review common overuse and traumatic shoulder injuries
- Be able to treat common shoulder disorders

Shoulder Injuries in the Industrial Athlete

- Anatomy
- Biomechanics
- History
- Examination
- Common Injuries

Shoulder Injuries in the Industrial Athlete

- Anatomy
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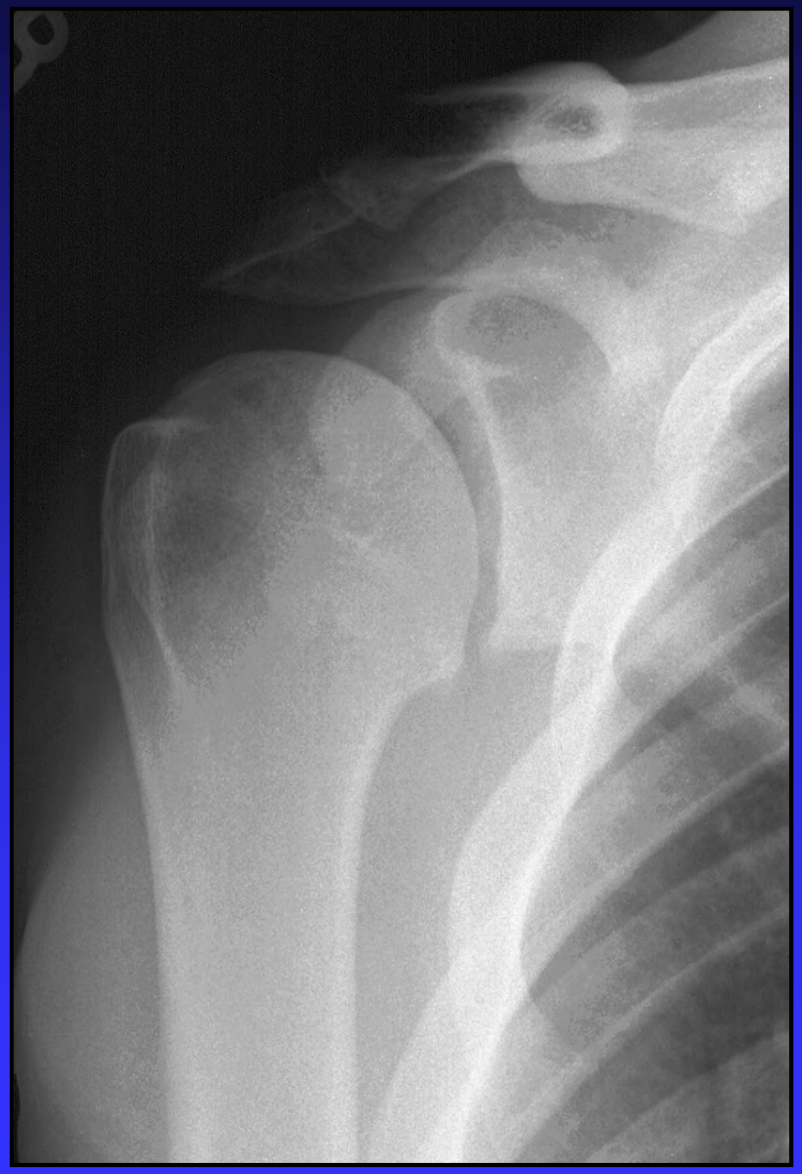
- Common Injuries

Shoulder Anatomy

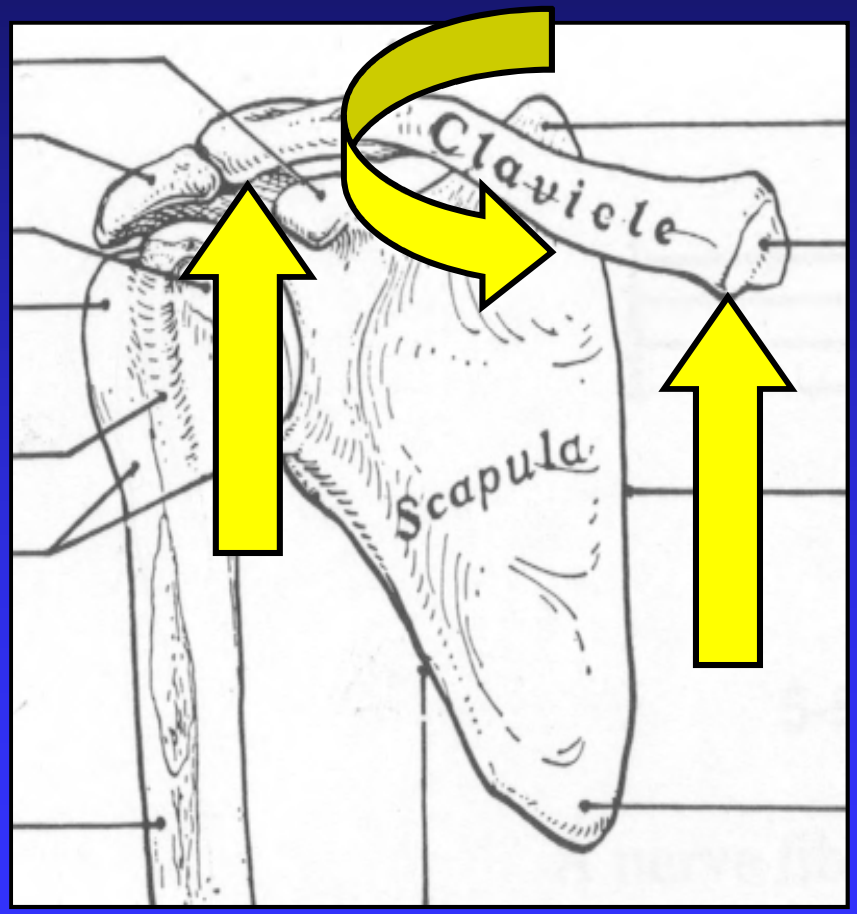
- Bones
- Joints and Ligaments
- Muscles
- Neurovascular
- Bursae



Bones

Clavicle

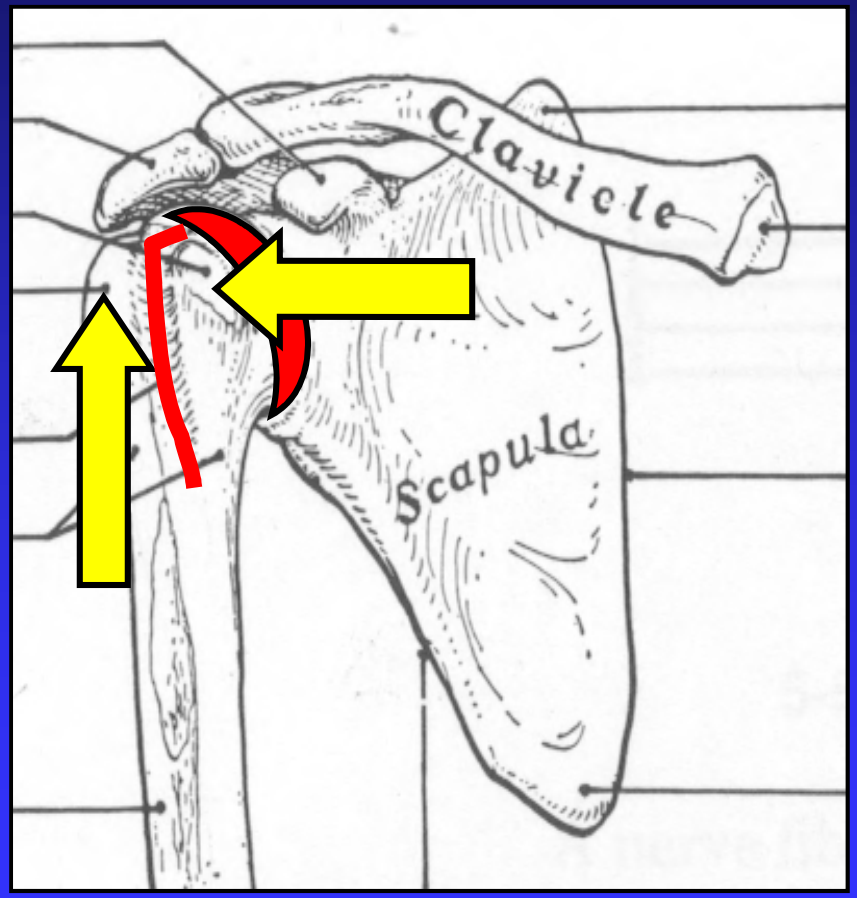
- S shaped
- Only bone to connect arm to axial skeleton
- Medial tubular/sternum
- Lateral flat/acromium
- Rotates along long axis
- Stabilize, protect plexus



Bones

Proximal Humerus

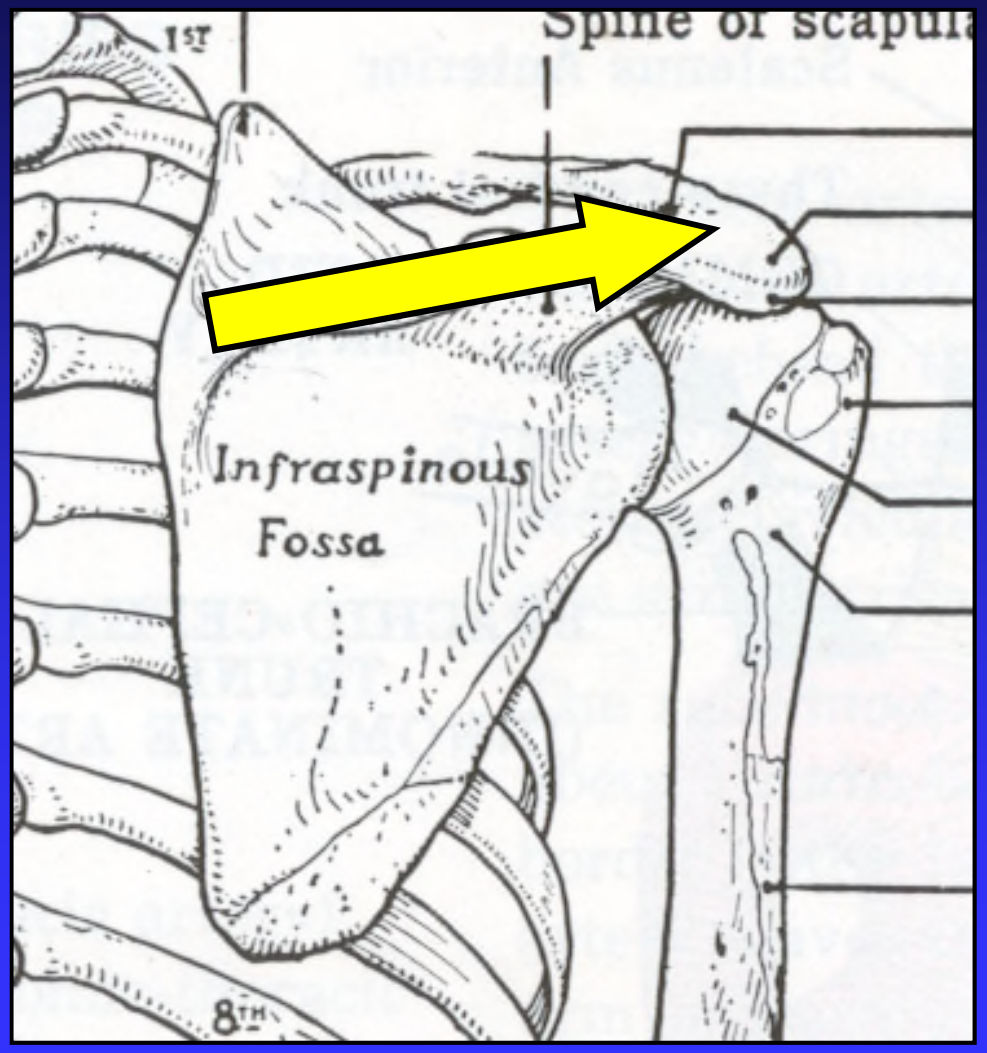
- Spherical
- 130º inclination
- 30º retroversion
- 1/3 articular cartilage
- Greater and lesser tuberosities
- Intertubercular groove



Bones

Scapula

- Body
- Spine
- Scapular neck
- Coracoid process
- Glenoid fossa
- Acromium



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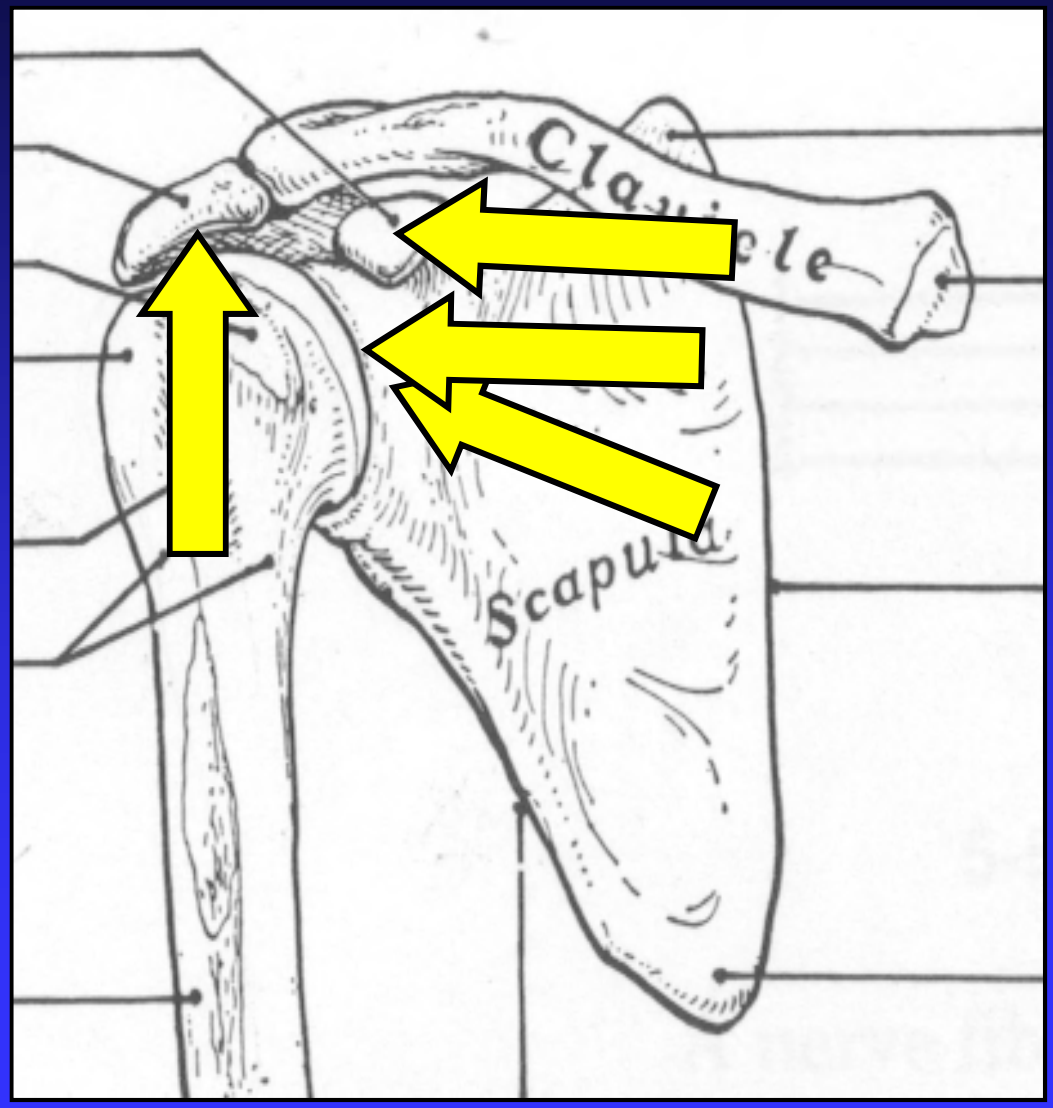

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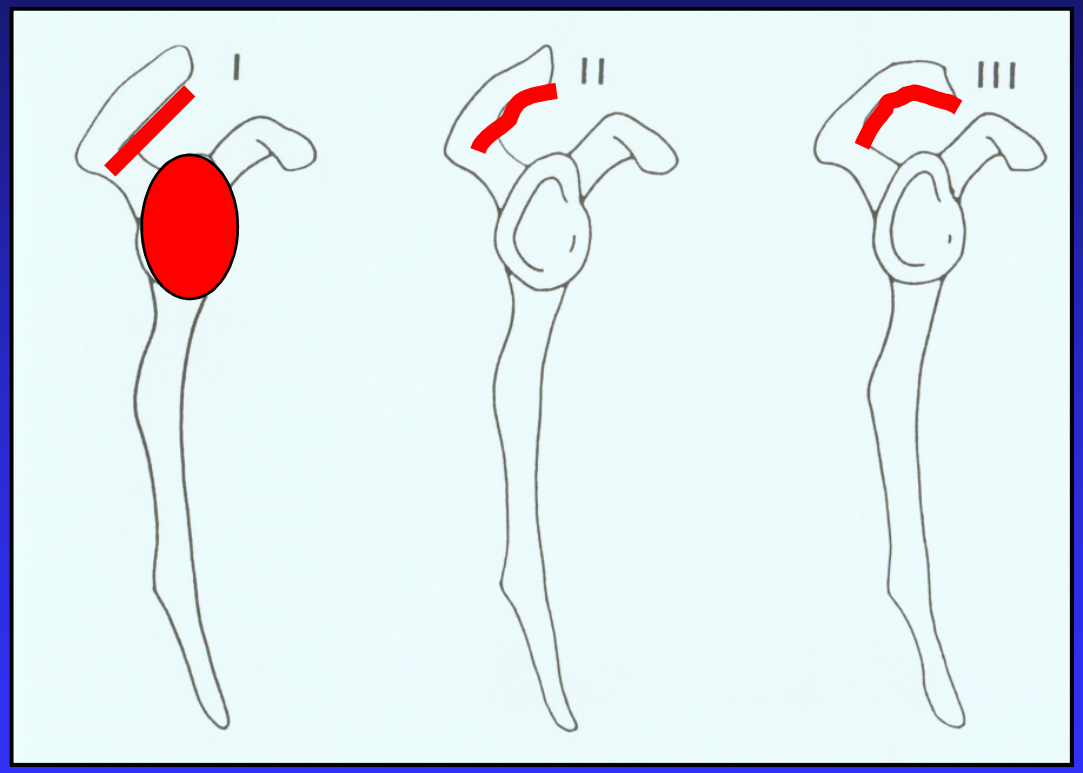
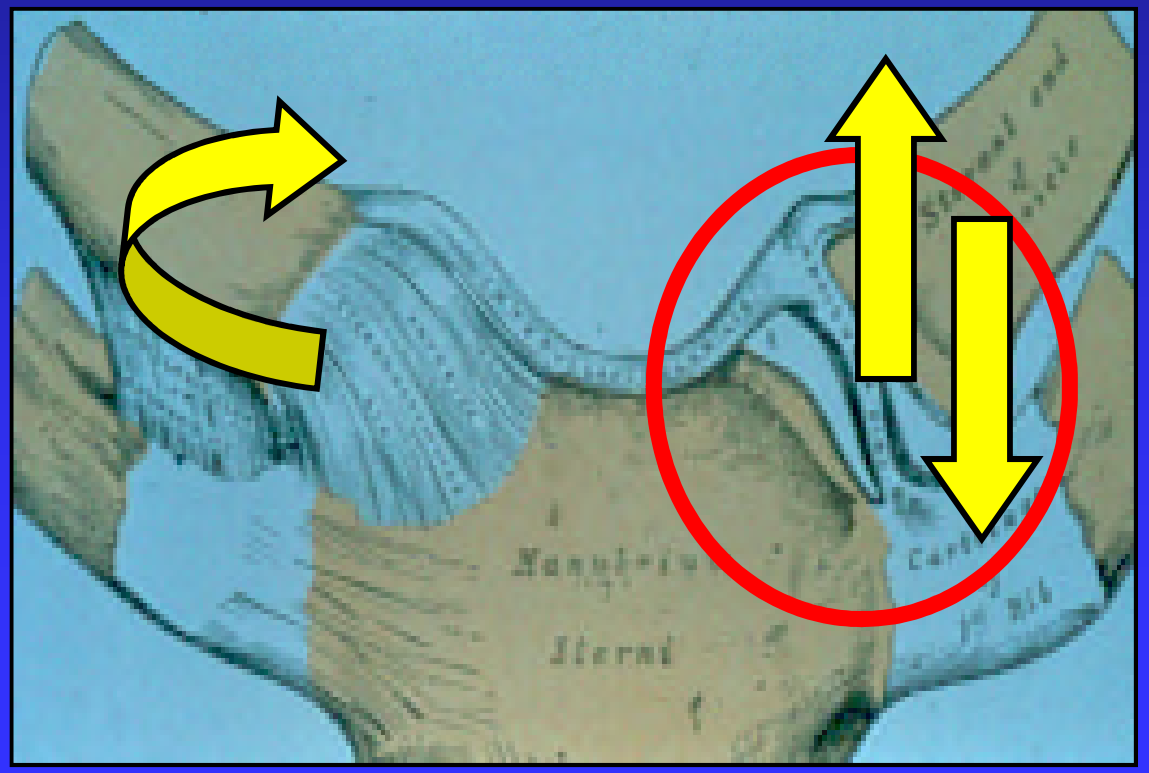


Joints and Ligaments

Sternoclavicular joint

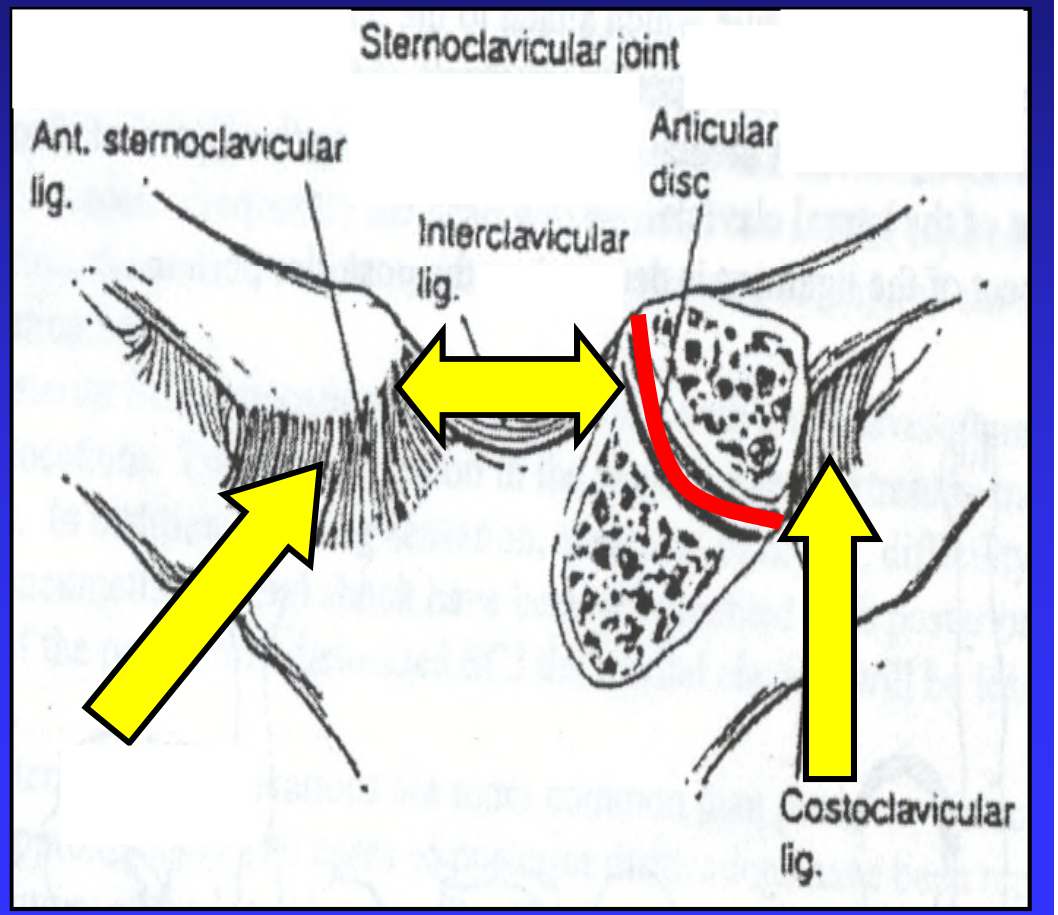
- Only joint to connect arm to axial skeleton
- Unstable ball and socket
- 1st rib cartilage
- 35º elevation
- 50º rotation



Joints and Ligaments

Sternoclavicular joint

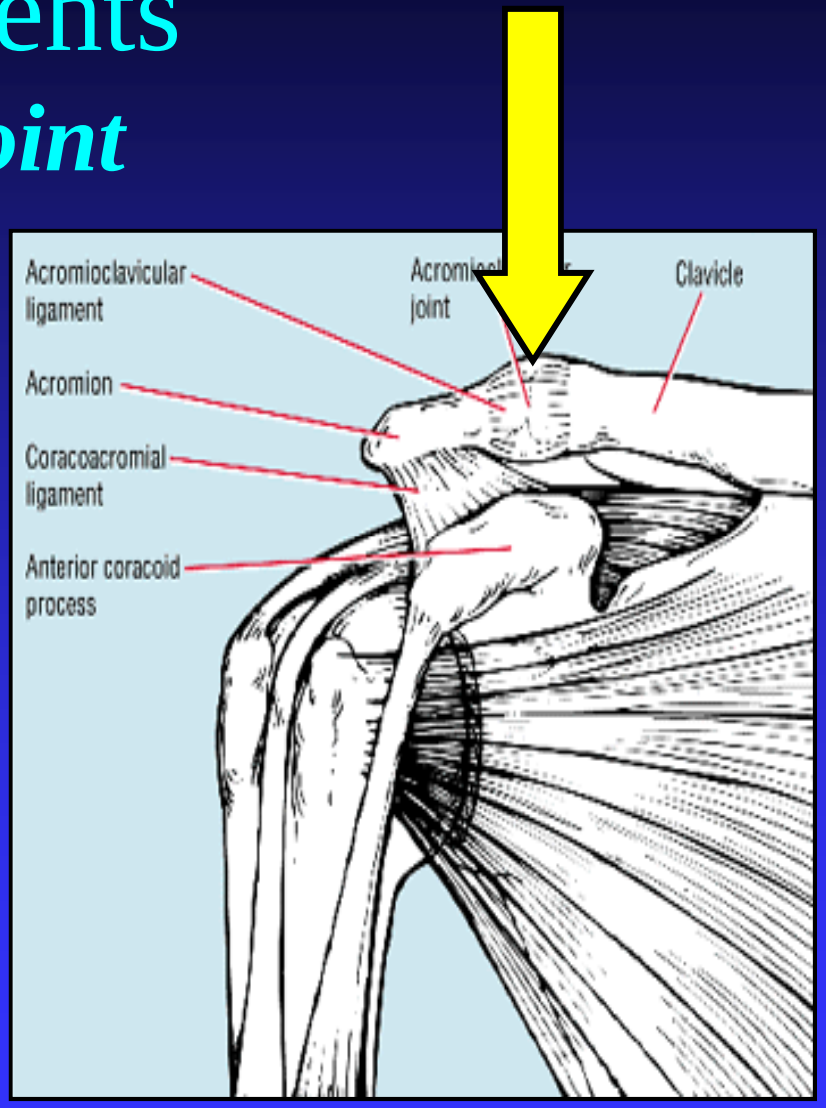
- Intraarticular disc
- Ligaments
  - costoclavicular
  - interclavicular
  - sternoclavicular



Joints and Ligaments

Acromioclavicular joint

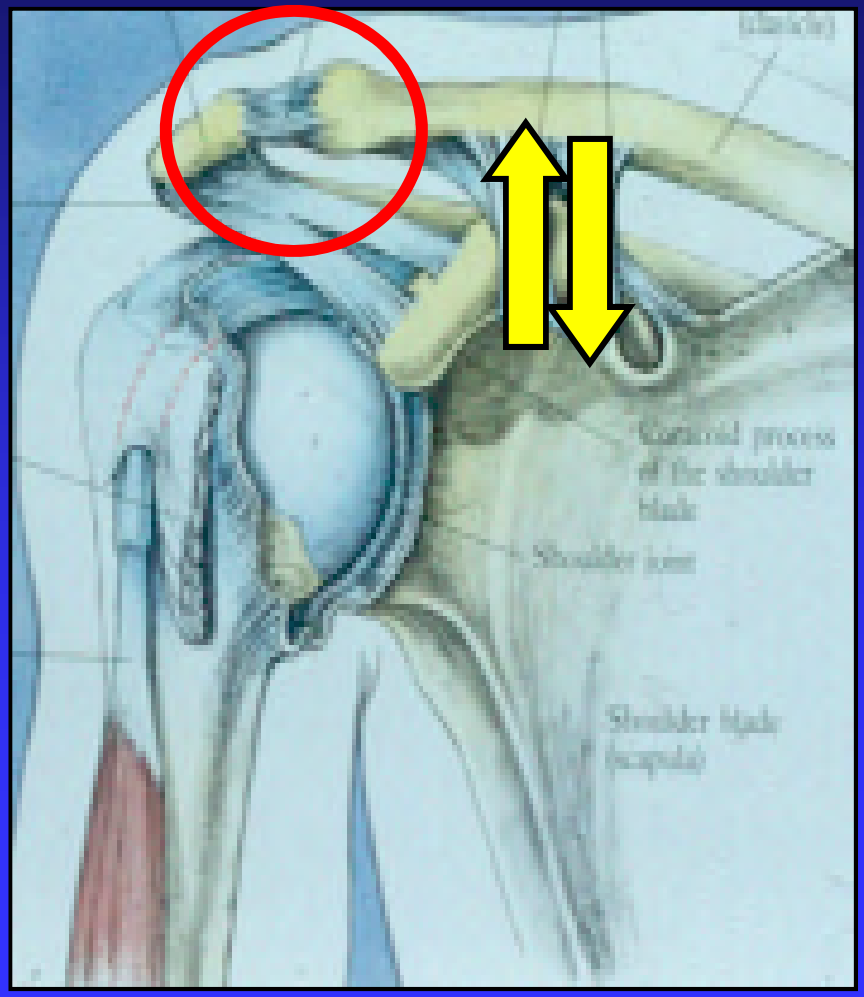
- Only connection of clavicle to scapula
- Hyaline becomes fibrocartilage with aging
- Intrarticular disc
- 40º of rotation
- Transmit forces from extremity to axis



Joints and Ligaments

Acromioclavicular joint

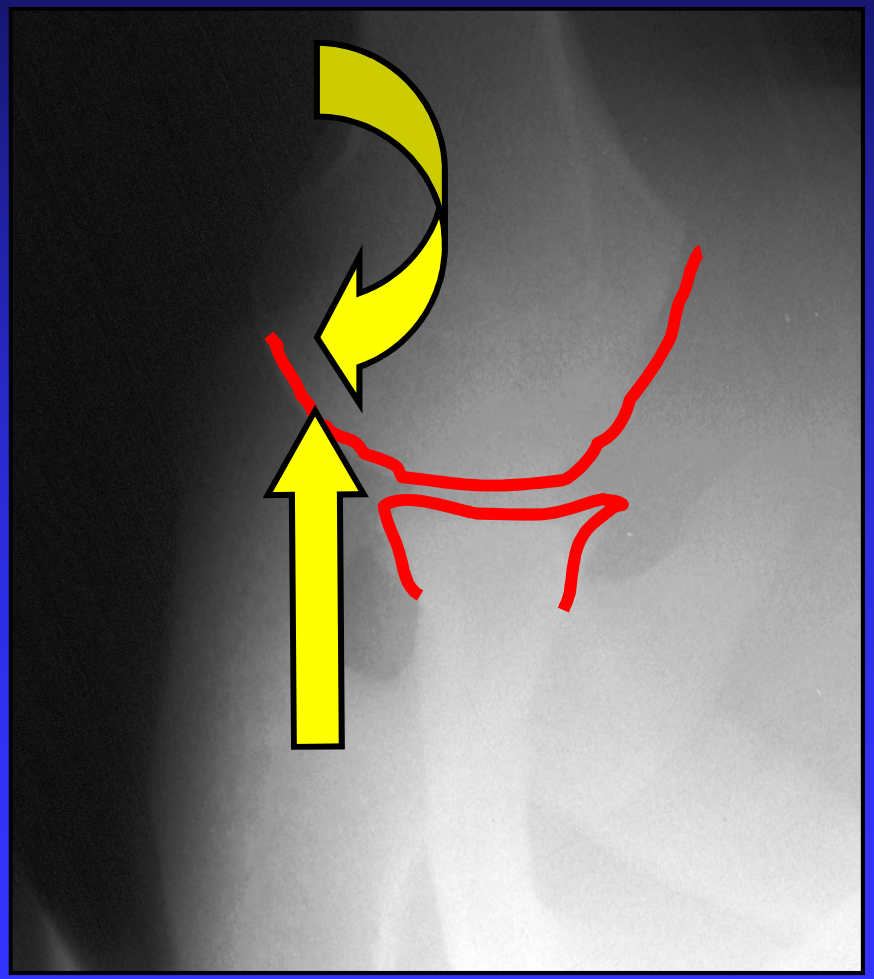
- AC ligaments
  - AP stability
  - axial distraction
- Coracacoclavicular ligs
  - Trapezoid-anterior scapular rotation
  - Conoid-posterior scapular rotation



Joints and Ligaments

Glenohumeral joint

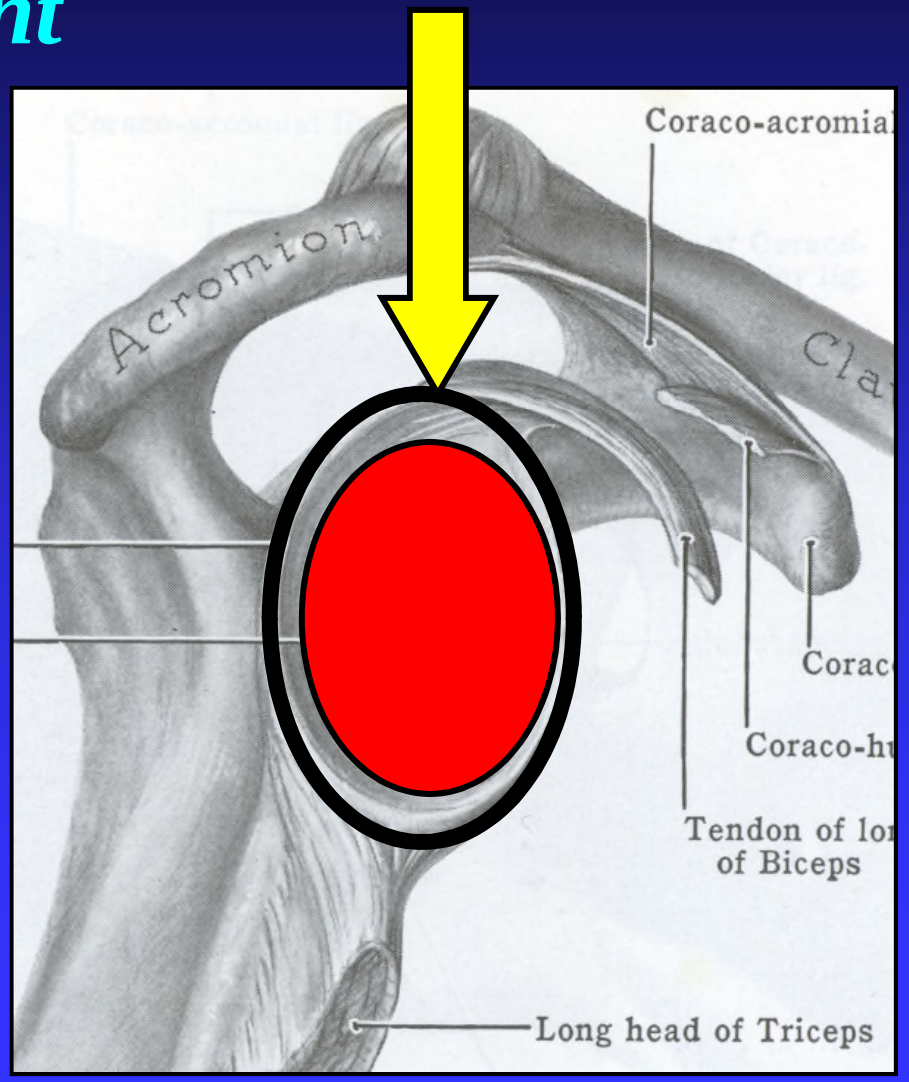
- Great mobility
- Poor stability
- .3mm superior/inferior translation
- 5mm anterior/posterior translation



Joints and Ligaments

Glenohumeral joint

- Glenoid
  - Peripheral cartilage
- Labrum
  - Fibrocartilage
  - Thick periphery
  - GH lig and biceps tendon



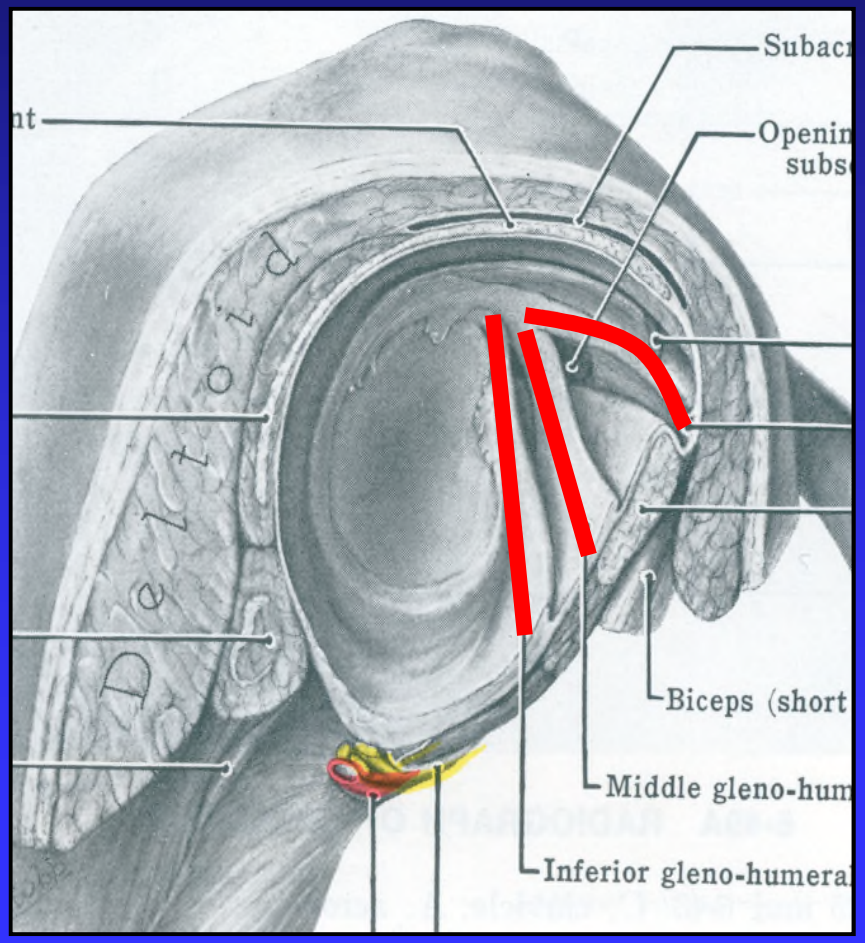
Joints and Ligaments

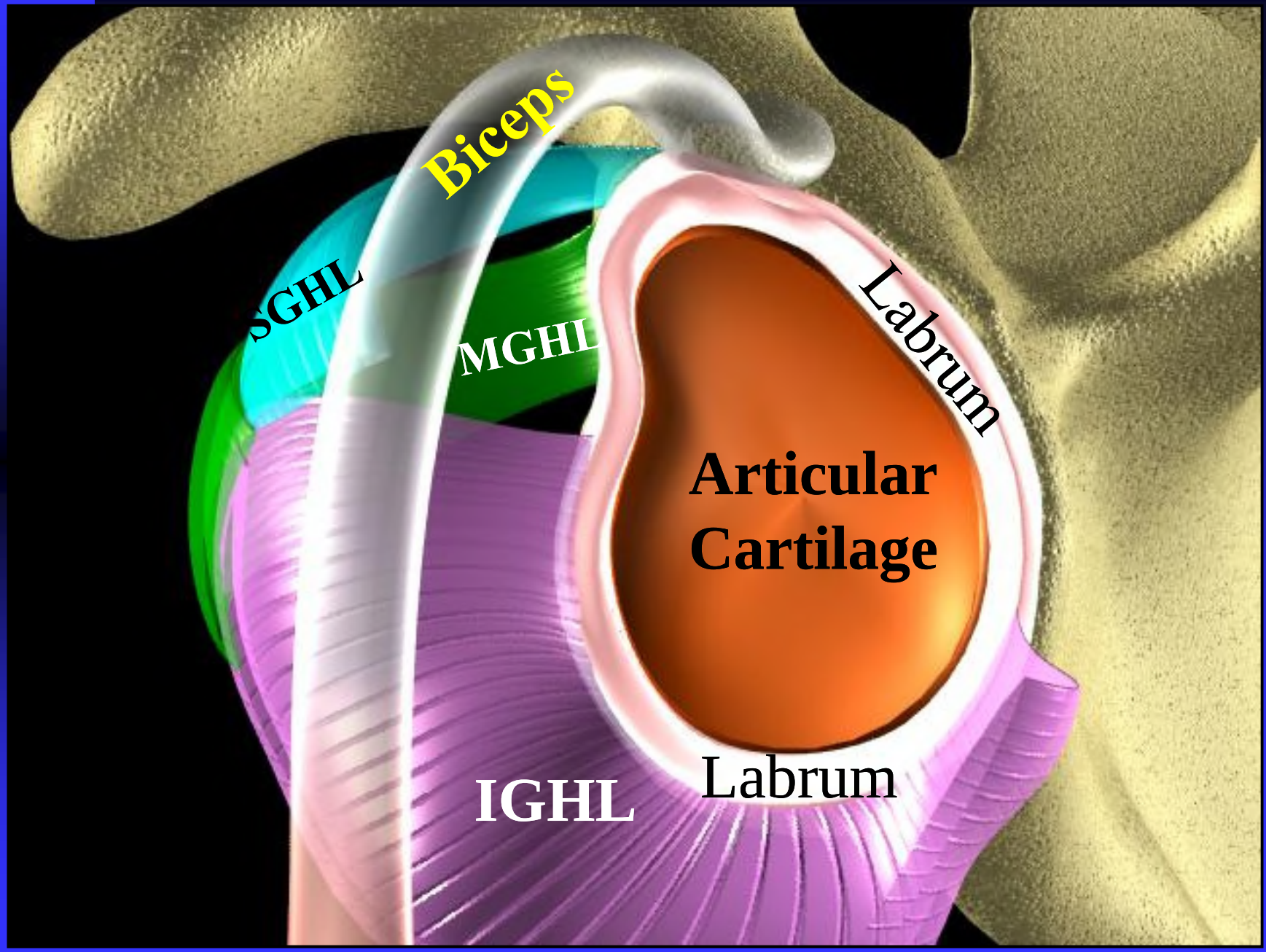
Glenohumeral joint

- GH capsule
  - Twice SA humeral head
  - Synovial lining
  - Minimal fluid
  - Negative intraarticular pressure
  - Check rein

Joints and Ligaments
Glenohumeral joint

- GH ligaments
  - Collagen thickening
  - Superior
  - Middle
  - Inferior
  - Static stability
  - Primary stabilizer at extremes of motion

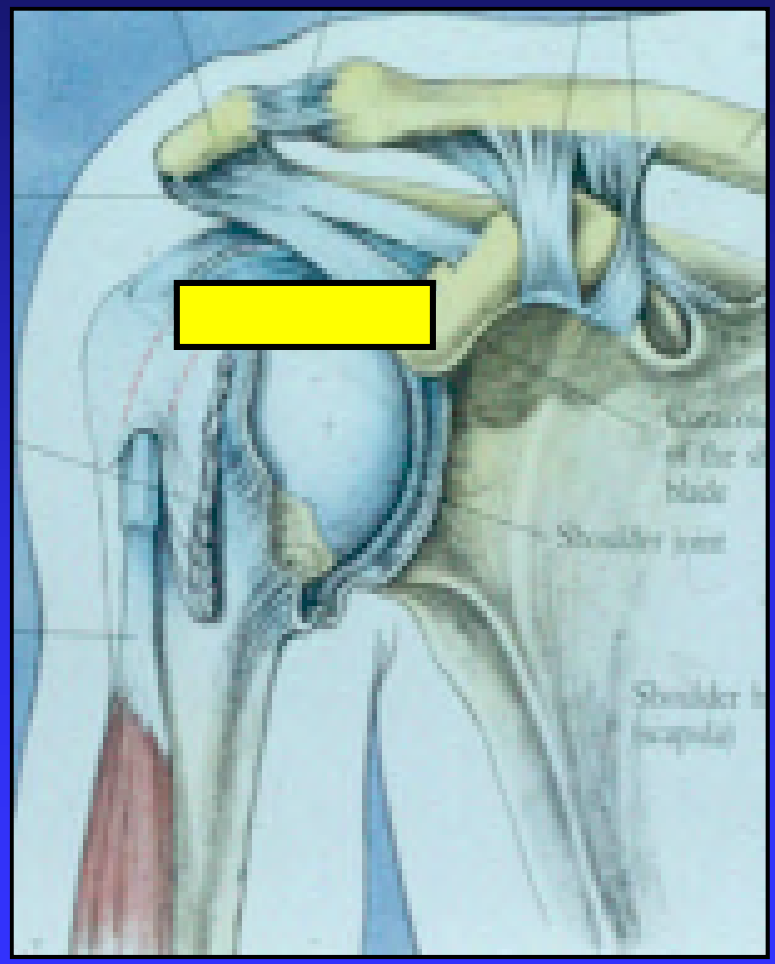



Biceps
SGHL
MGHL
Labrum
Articular
Cartilage
IGHL
Labrum

Joints and Ligaments

Glenohumeral joint

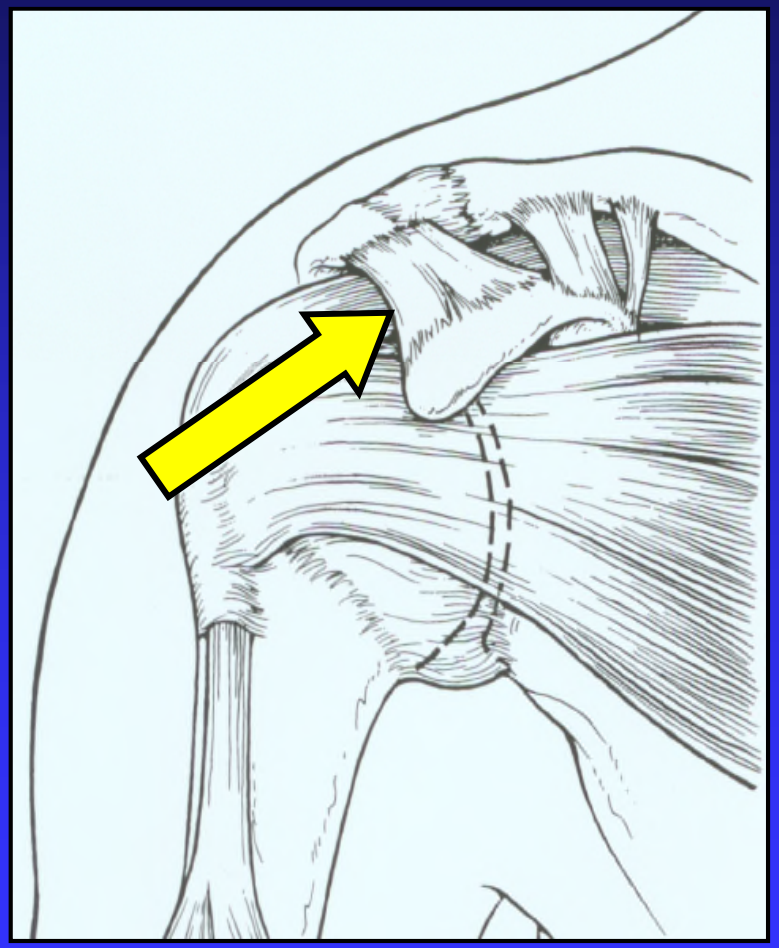
- Coracohumeral ligament
  - Coracoid to greater tub
  - Suspension of humerus
  - Inferior instability



Joints and Ligaments

Glenohumeral joint

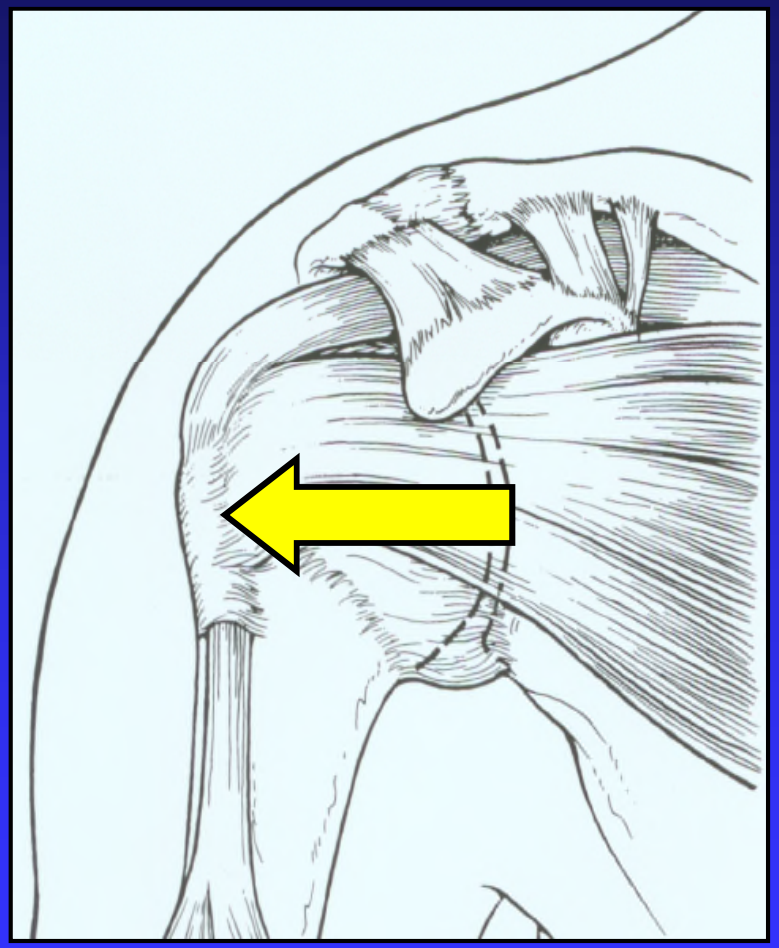
- Coracohumeral ligament
  - Coracoid to greater tub
  - Suspension of humerus
  - Inferior instability
- Coracoacromial ligament



Joints and Ligaments

Glenohumeral joint

- Coracohumeral ligament
  - Coracoid to greater tub
  - Suspension of humerus
  - Inferior instability
- Coracoacromial ligament
- Transverse humeral lig
  - Connect tuberosities
  - Maintain biceps tendon

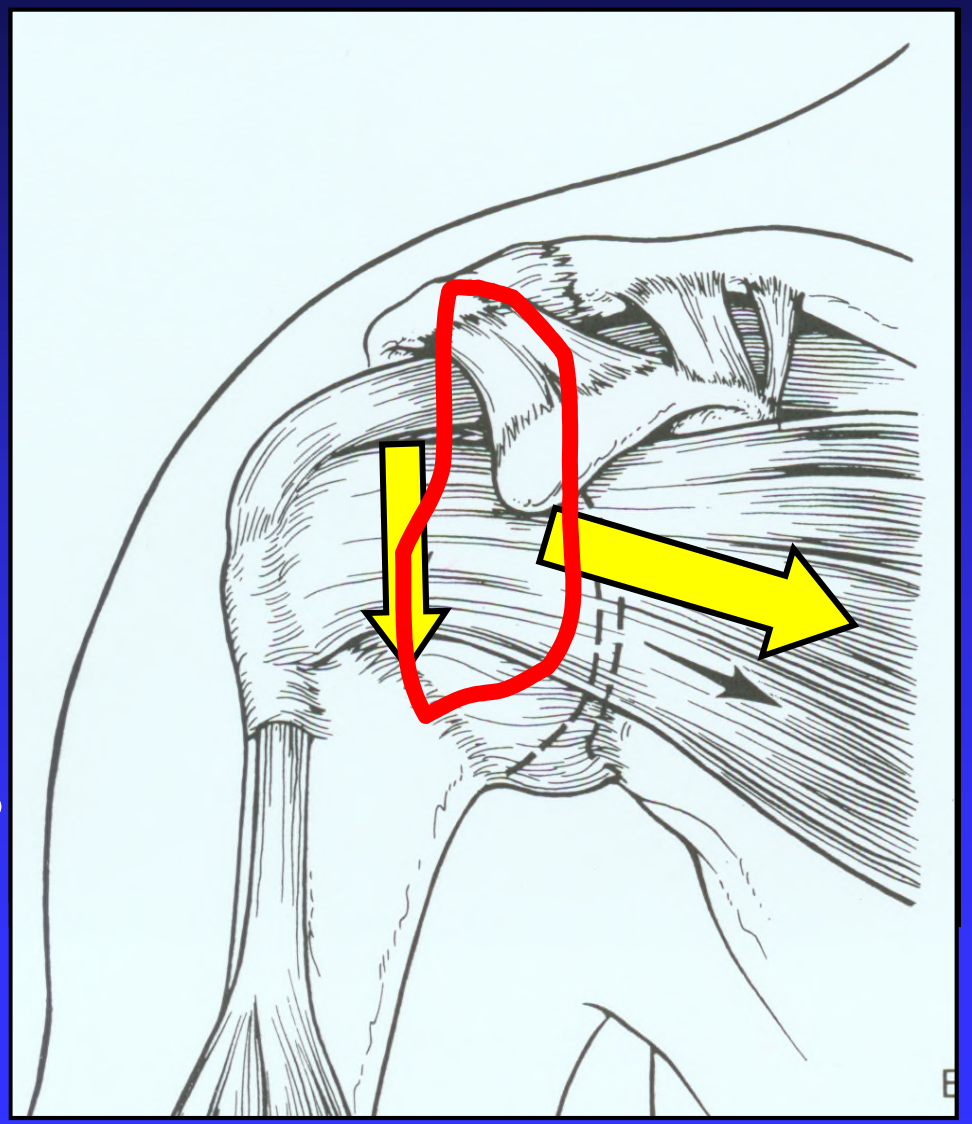


Joints and Ligaments
Scapulothoracic articulation

- Not a true joint
- Movement of scapula on chest wall
- Multiple muscles coordinate scapular movement

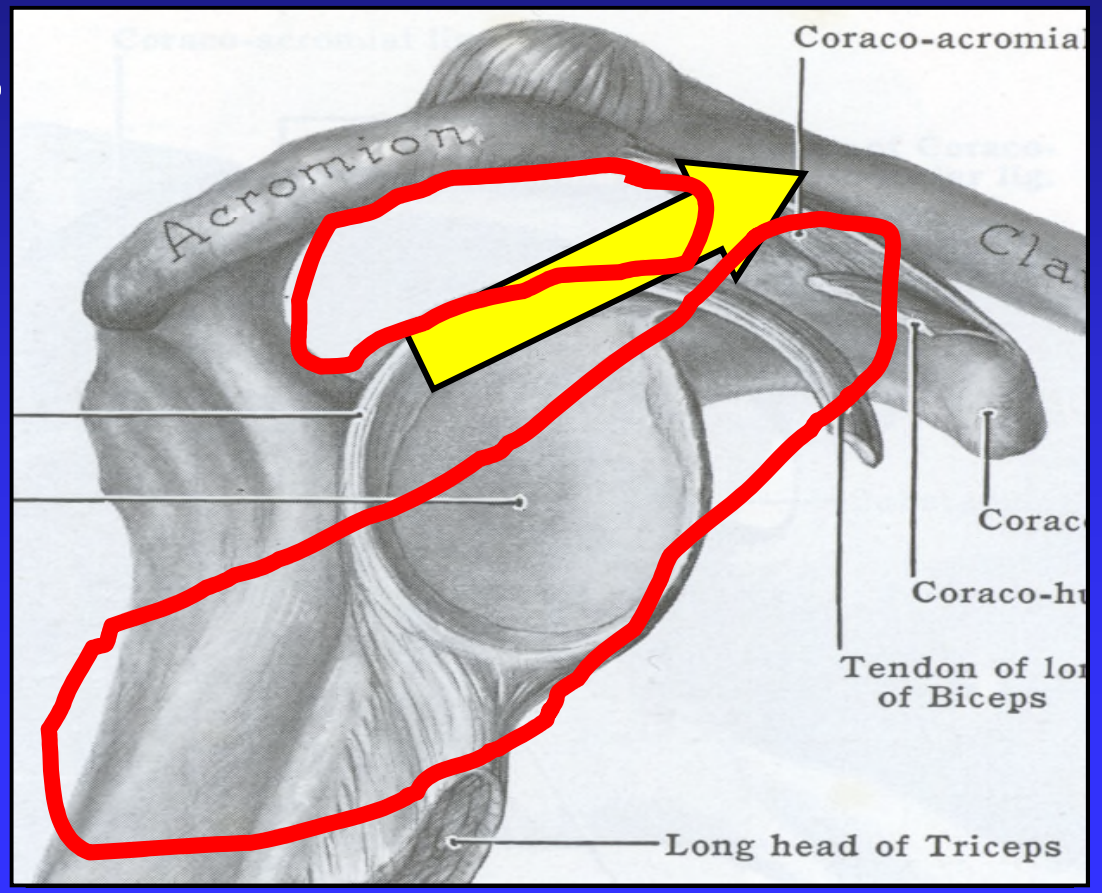
Muscles

- Rotator cuff
  - Compresses humeral head
  - Centers humerus
  - Active stabilizer
  - Resists displacing forces



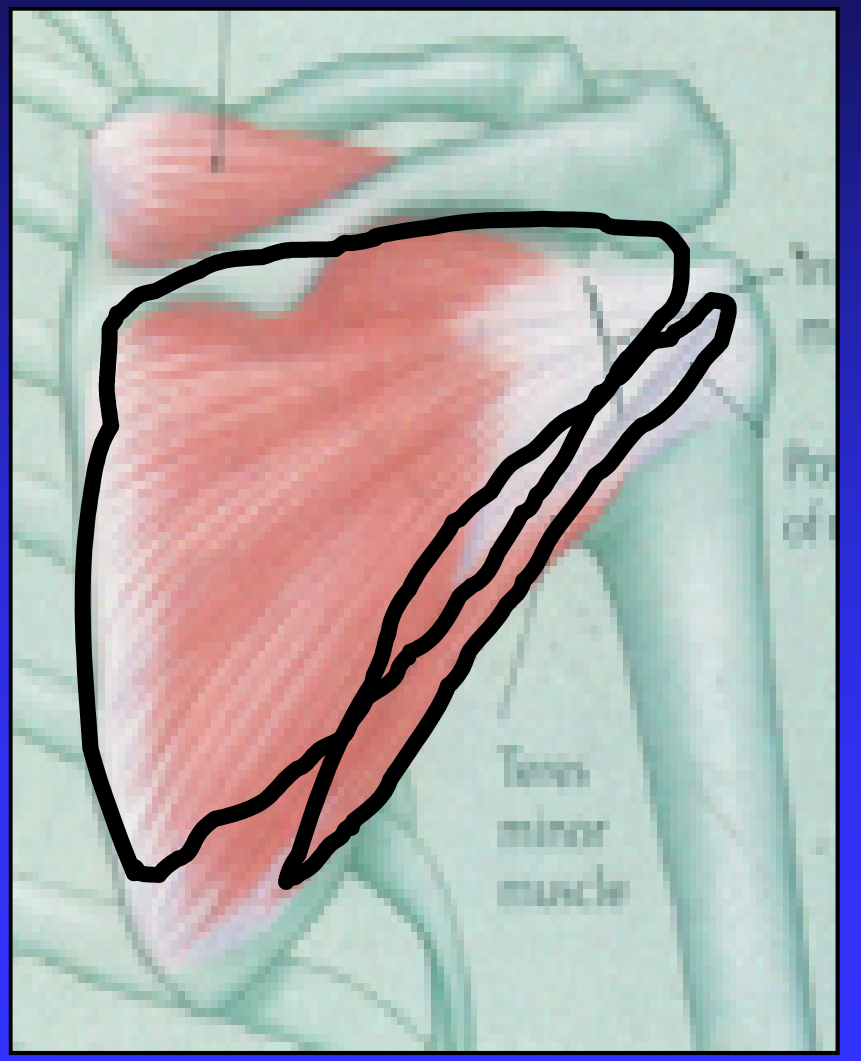
Muscles

- Supraspinatus - abduct/ depress/compress



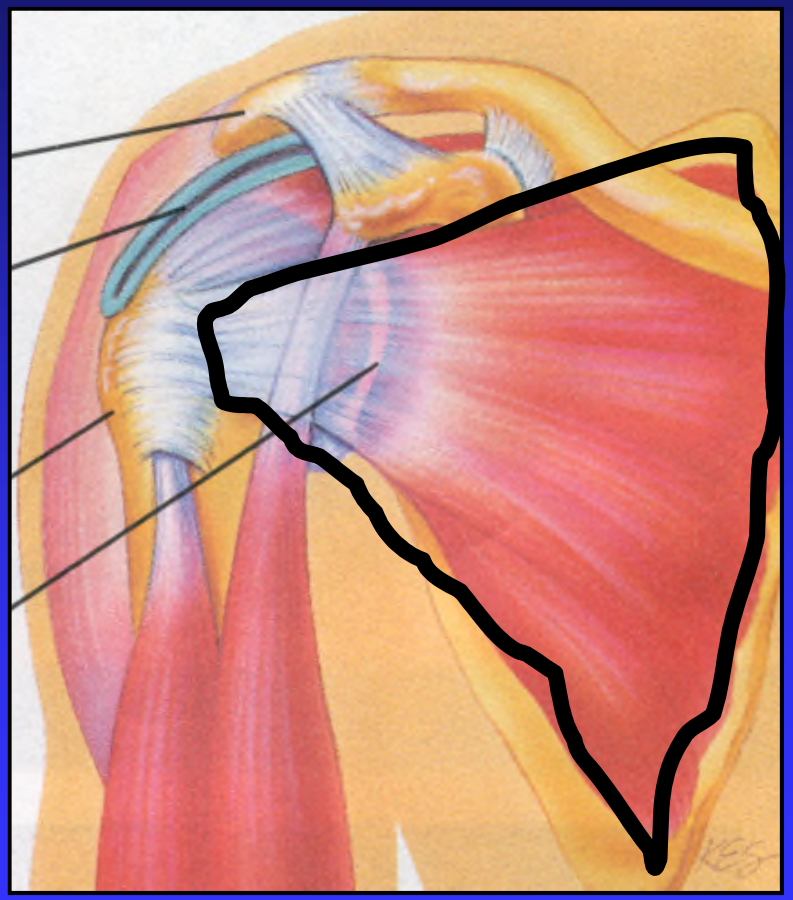
Muscles

- Supraspinatus - abduct/ depress/compress
- Infraspinatus - ER/ab/ad
- Teres minor - ER/ad



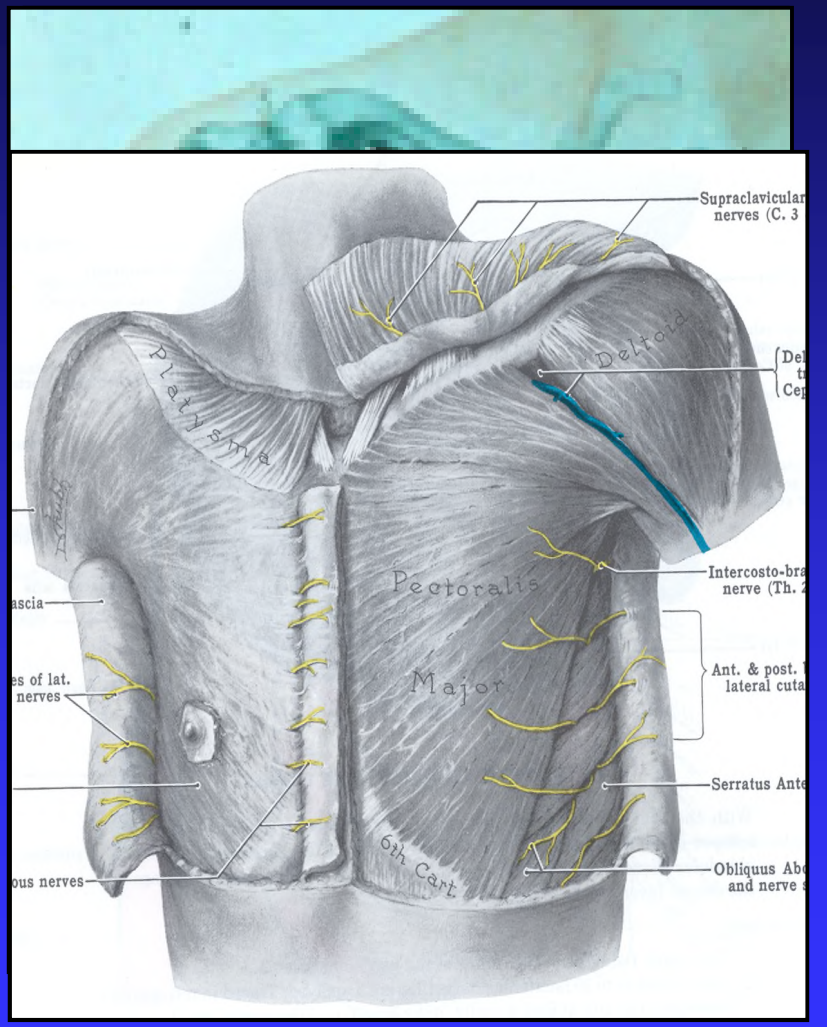
Muscles

- Supraspinatus - abduct/ depress/compress
- Infraspinatus - ER/ab/ad
- Teres minor - ER/ad
- Subscapularis -IR/ab/ad/ flex/extend



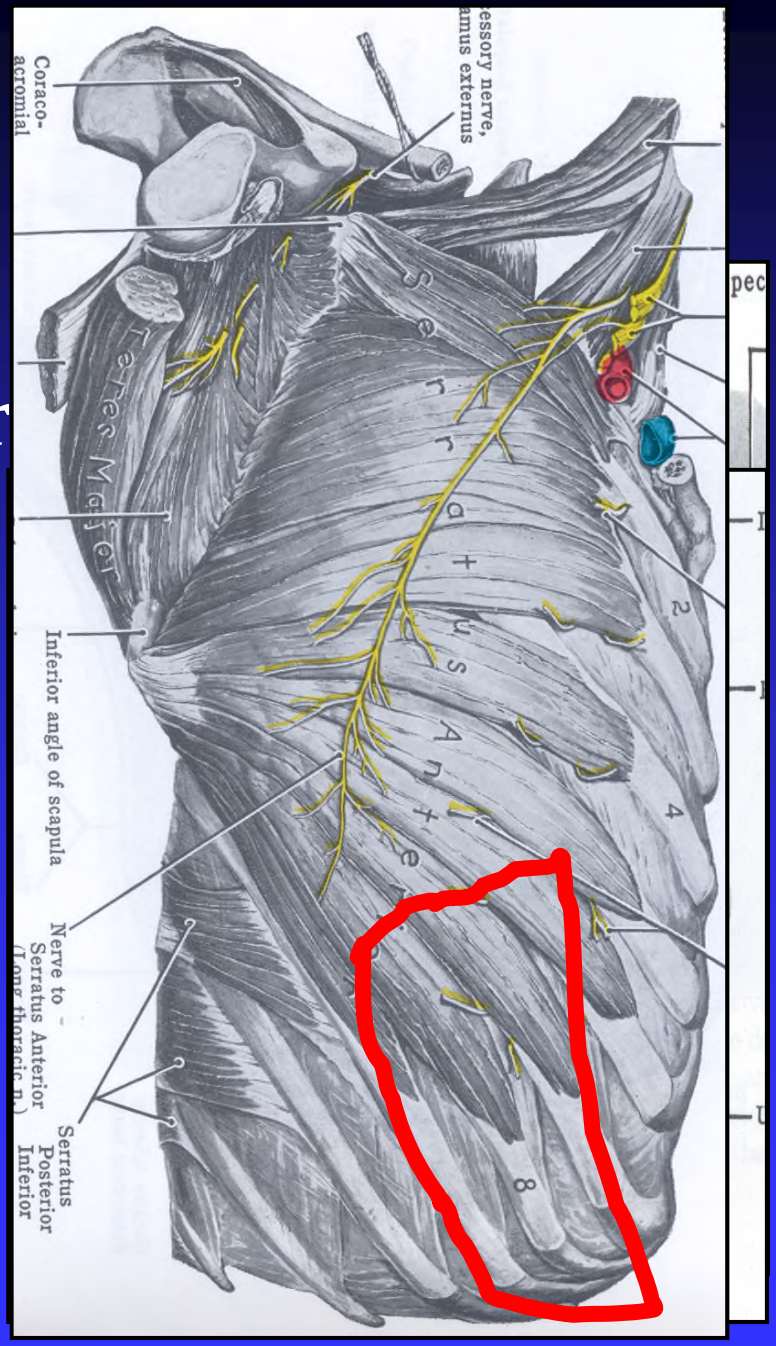
Muscles

- Biceps - flex, supinate, depress humerus
- Coracobrachialis-flex/ad
- Pec major - flex/ad/IR
- Pec minor - draw scapula forward and downward



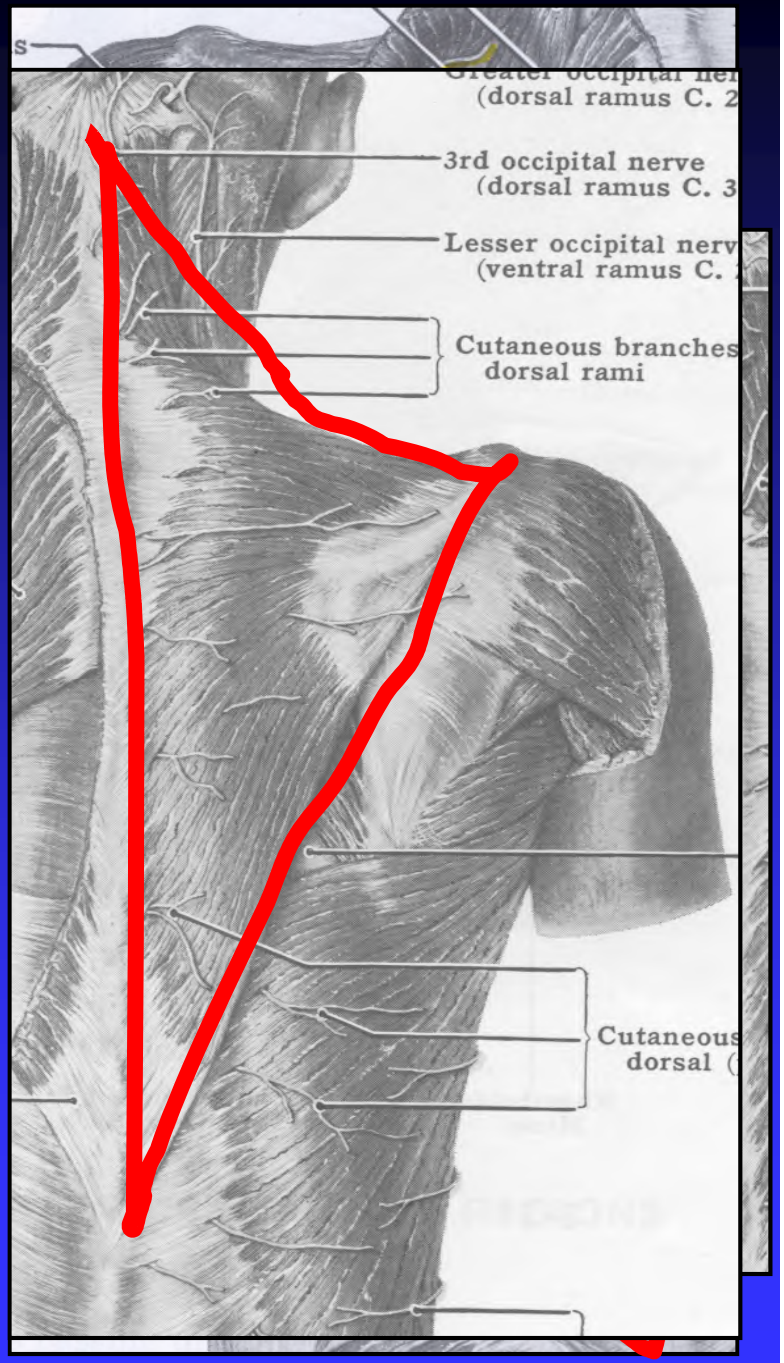
Muscles

- Subclavius - hold shoulder down and forward
- Deltoid - primary mover
- Triceps - ex/ad
- Teres major - ad/ex/IR
- Serratus - stabilize, rotate, draw scapula forward



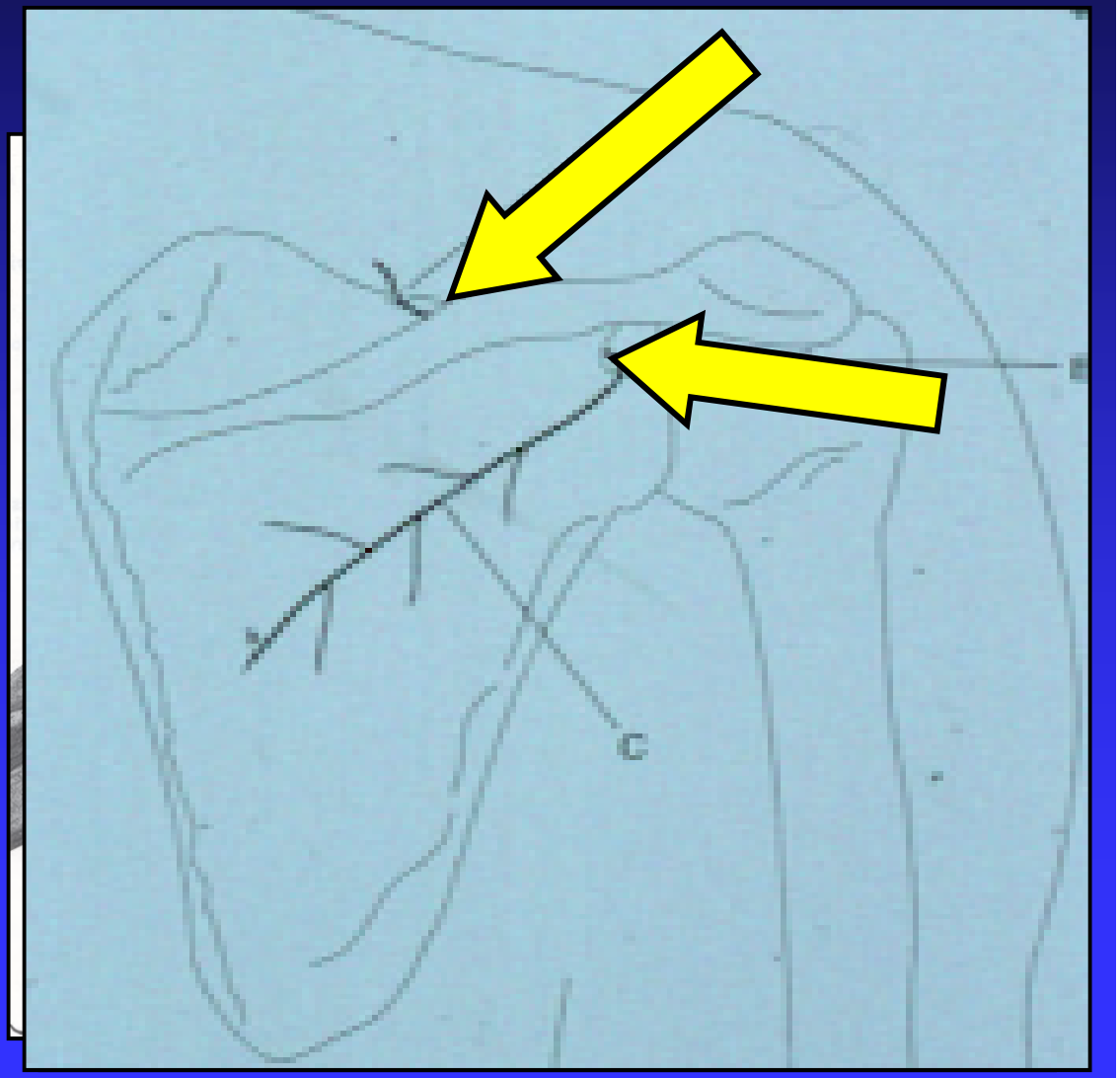
Muscles

- Rhomboids - draw scapula medial, depress shoulder
- Levator scapula - elevate and rotate scapula
- Lattisimus dorsi - ex/ad/IR
- Trapezius – raises, lowers, rotates, adducts scapula



Neurovascular

- Brachial Plexus
  - Roots
  - Trunks
  - Divisions
  - Cords
  - Nerves
- Axillary Artery
- Subclavian Vein



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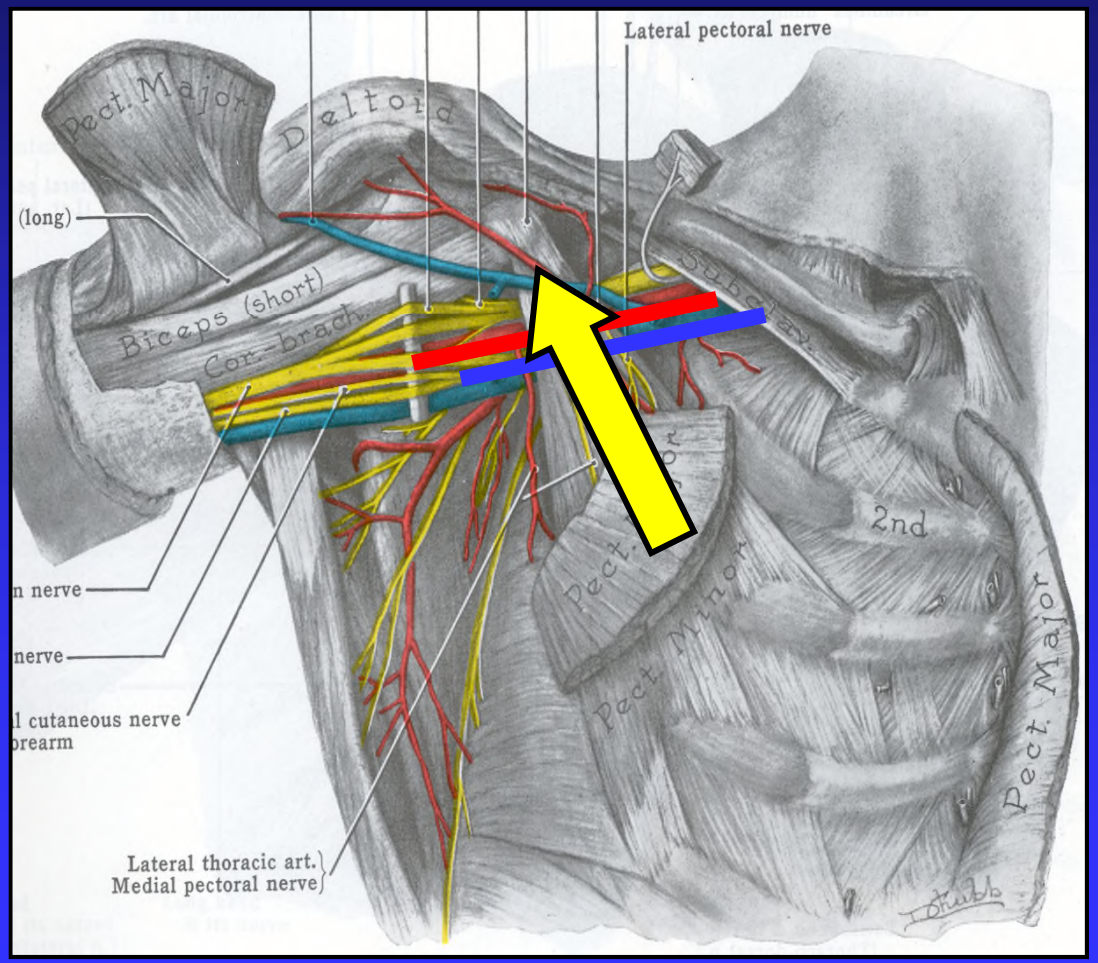
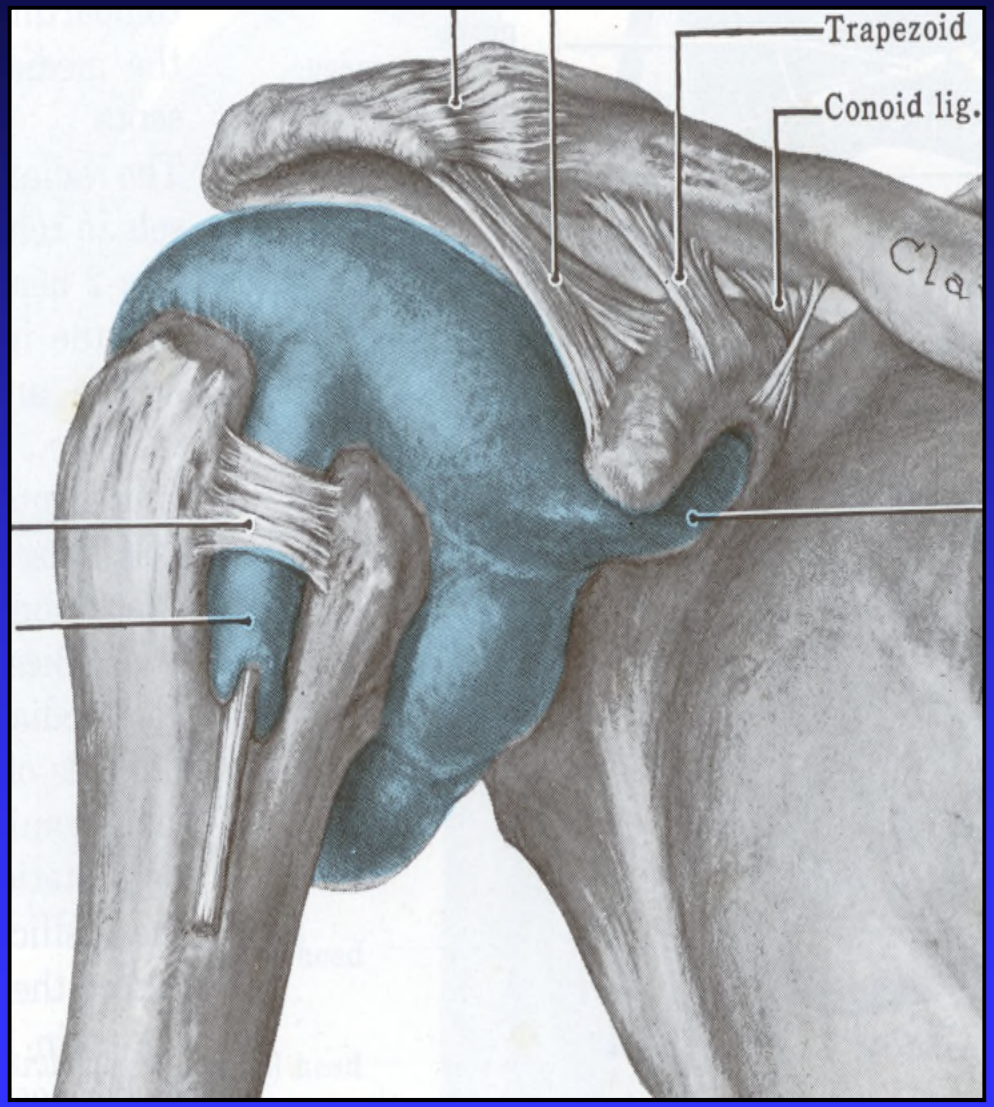


Bursae

- Bursae
  - Subacromial
  - Subdeltoid
  - Subscapular
  - Biceps
  - Scapulothoracic



Shoulder Injuries in the Industrial Athlete

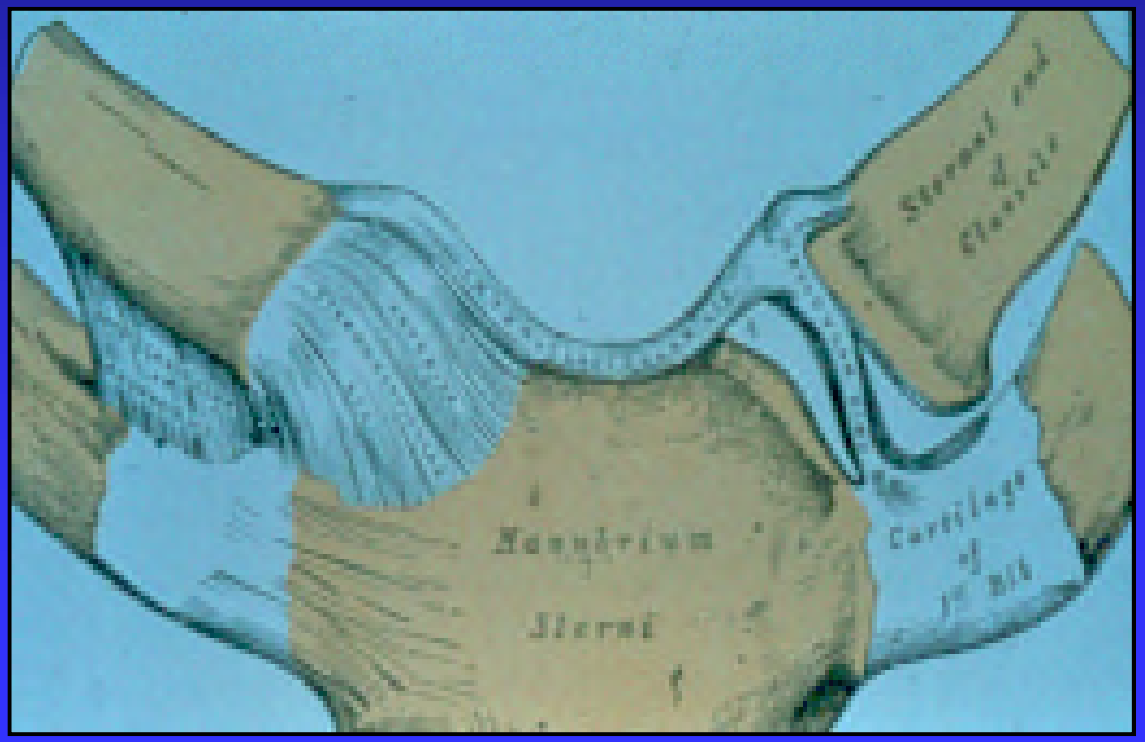
- Anatomy
- Biomechanics
- History
- Examination
- Common Injuries

Shoulder Biomechanics

- Result of 4 joints moving simultaneously and synchronously
- Humerus moves 2x as fast and far as scapula
- Abduction 180^{o} -- Adduction 45^{o}
- Flexion 160^{o} -- Extension 45^{o}
- Internal Rotation 90^{o} -- External Rotation 100^{o}
- Scapula -- elevate/depress, pro/retract

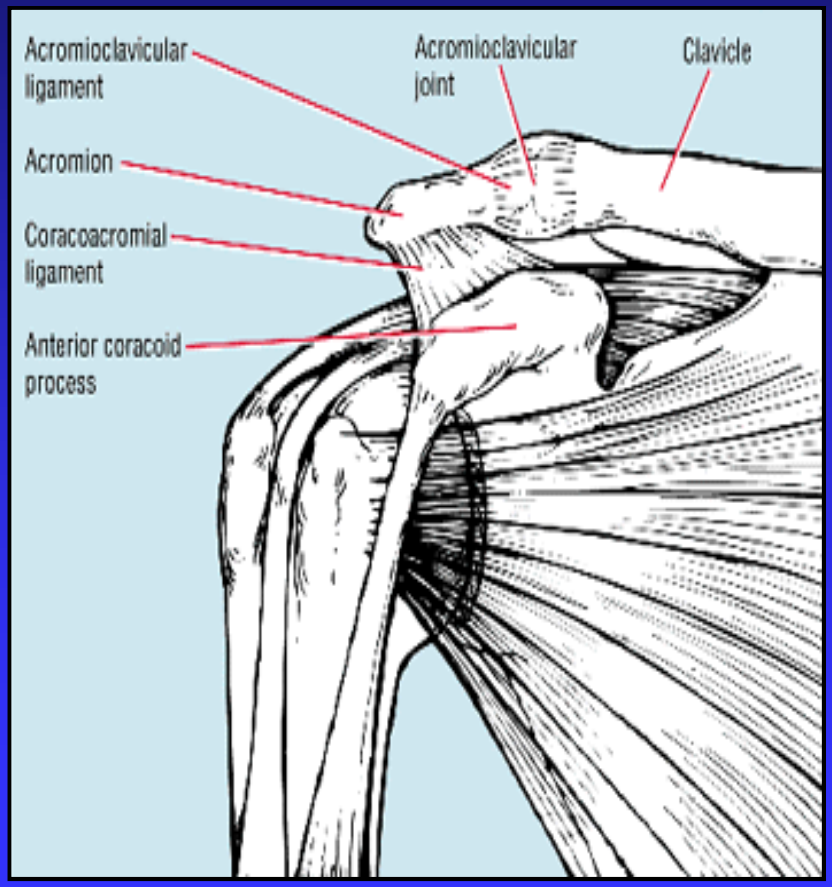
Shoulder Biomechanics

- Sternoclavicular joint
  - 35º anterior/posterior
  - 35º elevation
  - 45º rotation



Shoulder Biomechanics

- Sternoclavicular joint
  - 35° anterior/posterior
  - 35° elevation
  - 45° rotation
- Acromioclavicular joint
  - 20° rotation first 20°
  - 20° rotation last 40°

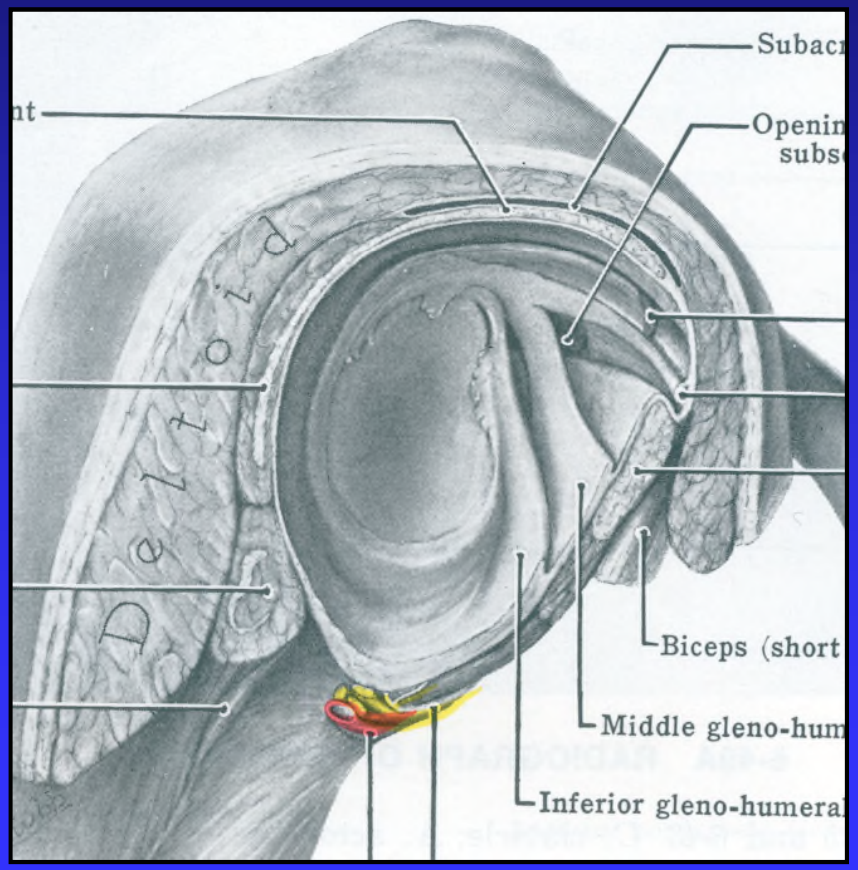


Shoulder Biomechanics

- Scapulothoracic joint
  - none during first 60^{o} flexion or 30^{o} abduction
  - synchronous with GH
  - 3^{o} GH for each 2^{o} ST

Shoulder Biomechanics

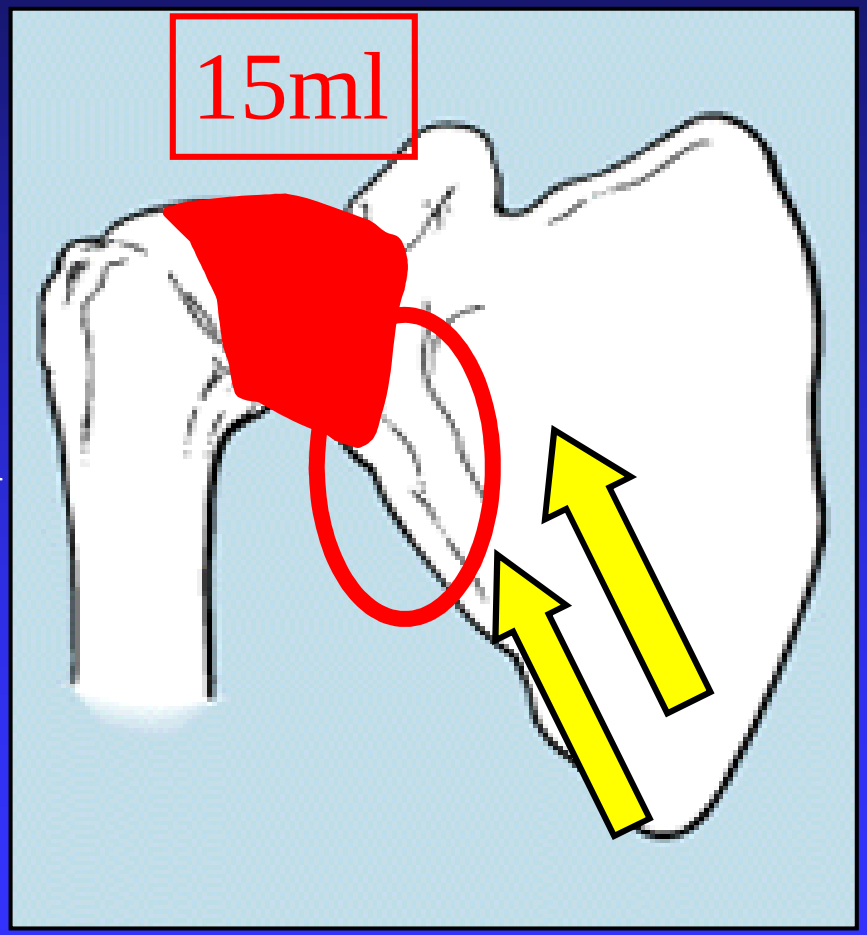
- Glenohumeral joint
  - 2/3 ab/flex, most ad/ext, all rotation
  - gliding and rolling
  - 3mm upward shift
  - instant center of rotation
  - effect of SC and AC joint and scapula motion
  - stability



Shoulder Biomechanics

glenohumeral stability-static

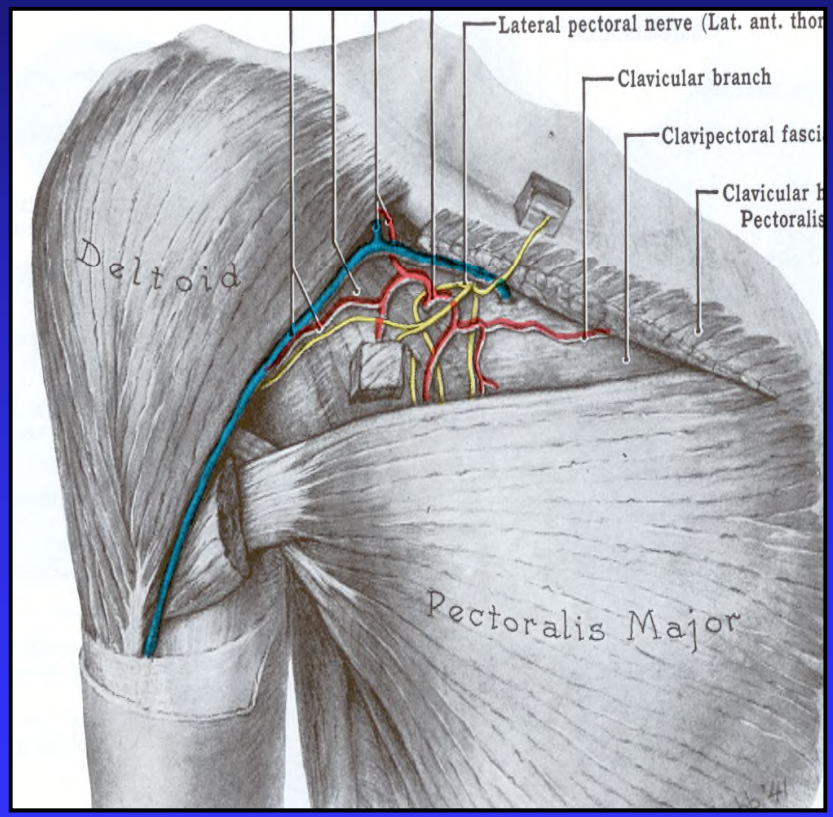
- Bone
- Labrum
- GH Ligaments
- Concavity-compression
- Capsule
- Finite joint volume



Shoulder Biomechanics

glenohumeral stability-dynamic

- Passive muscle bulk
- Muscle contraction
  - compresses joint surface
  - stiffens capsule
  - physical barrier
  - restraint
  - redirects joint reactive force to center of glenoid



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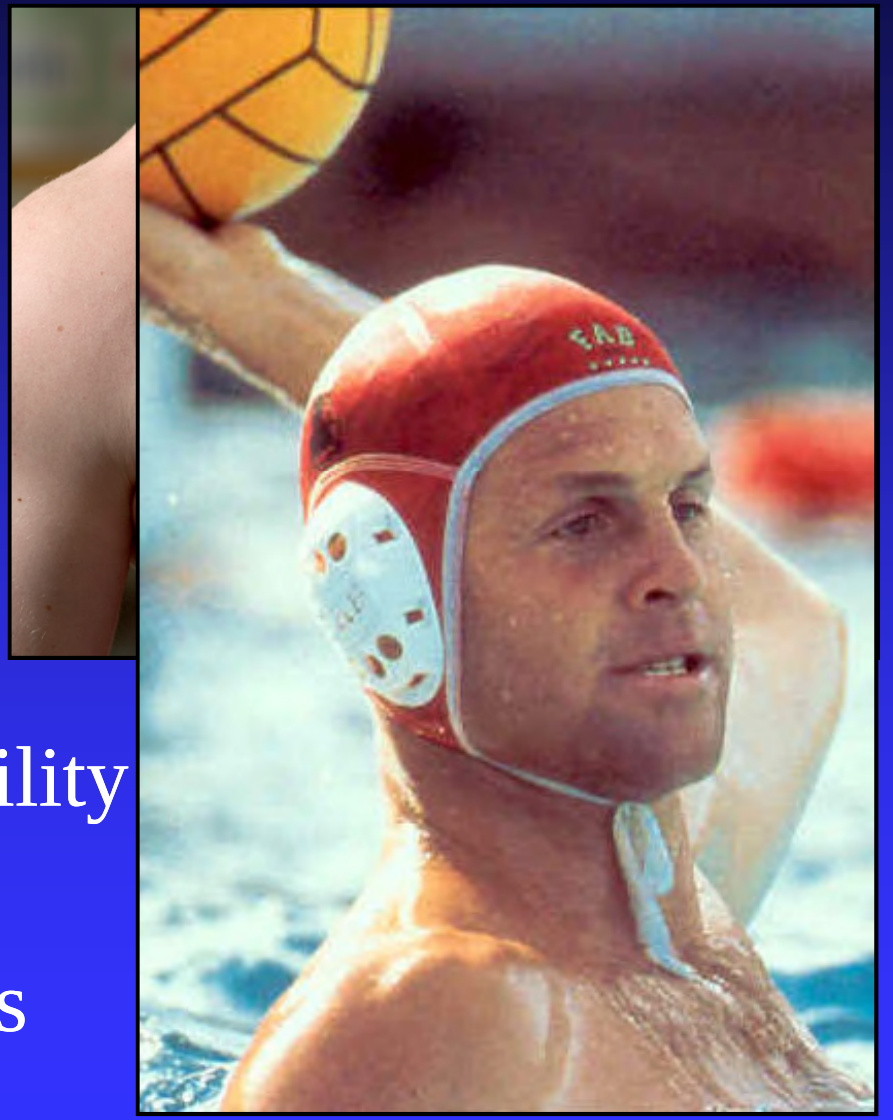
History

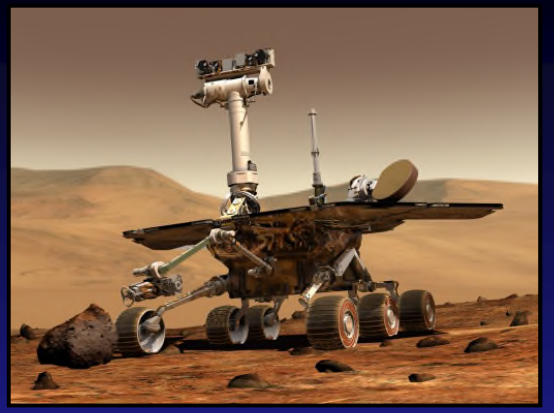
- History and exam essential for accurate DX
- Accurate diagnosis is required for successful treatment of any shoulder disorder
- Mechanism of injury is most important factor

History

- Chief complaint
  - Pain
  - Instability
  - Weakness
  - Loss of motion
  - Functional disability
  - Deformity
  - Catching/crepitus



History



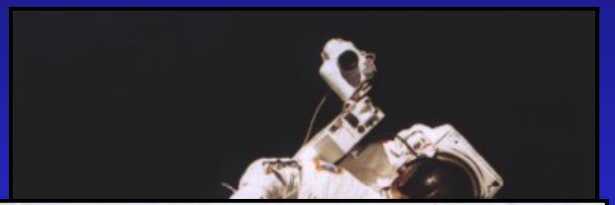
- Symptom onset-acute or chronic
- Qualitate and quantitate symptoms
- Activities that aggravate/relieve symptoms
- Night, exertional, radiating pain
- Paresthesias, dead arm, weakness
- Looseness, slipping sensation, shoulder “popping out of joint”

History

- Muscle atrophy or fatigue
- Clicking, catching, grinding, grating
- Edema
- Coolness, cyanosis
- Trauma
- Overuse risk factors

History

- Age, occupation, avocation, and handedness
- Job demands
- General medical health
- Medication
- Connective tissue diseases
- Workers compensation
- Litigation



WCU

Workers' Compensation University

Shoulder Injuries in the Industrial Athlete

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Examination

- Inspection-atrophy, swelling, discoloration
- ROM-symmetric, compensatory changes
- Palpation-deformity, tenderness
- Strength
- Impingement and stability
- Neck exam
- Neurovascular exam-sensation and reflexes

Examination

range of motion

Examination

palpation

Examination

strength and impingement testing

Examination

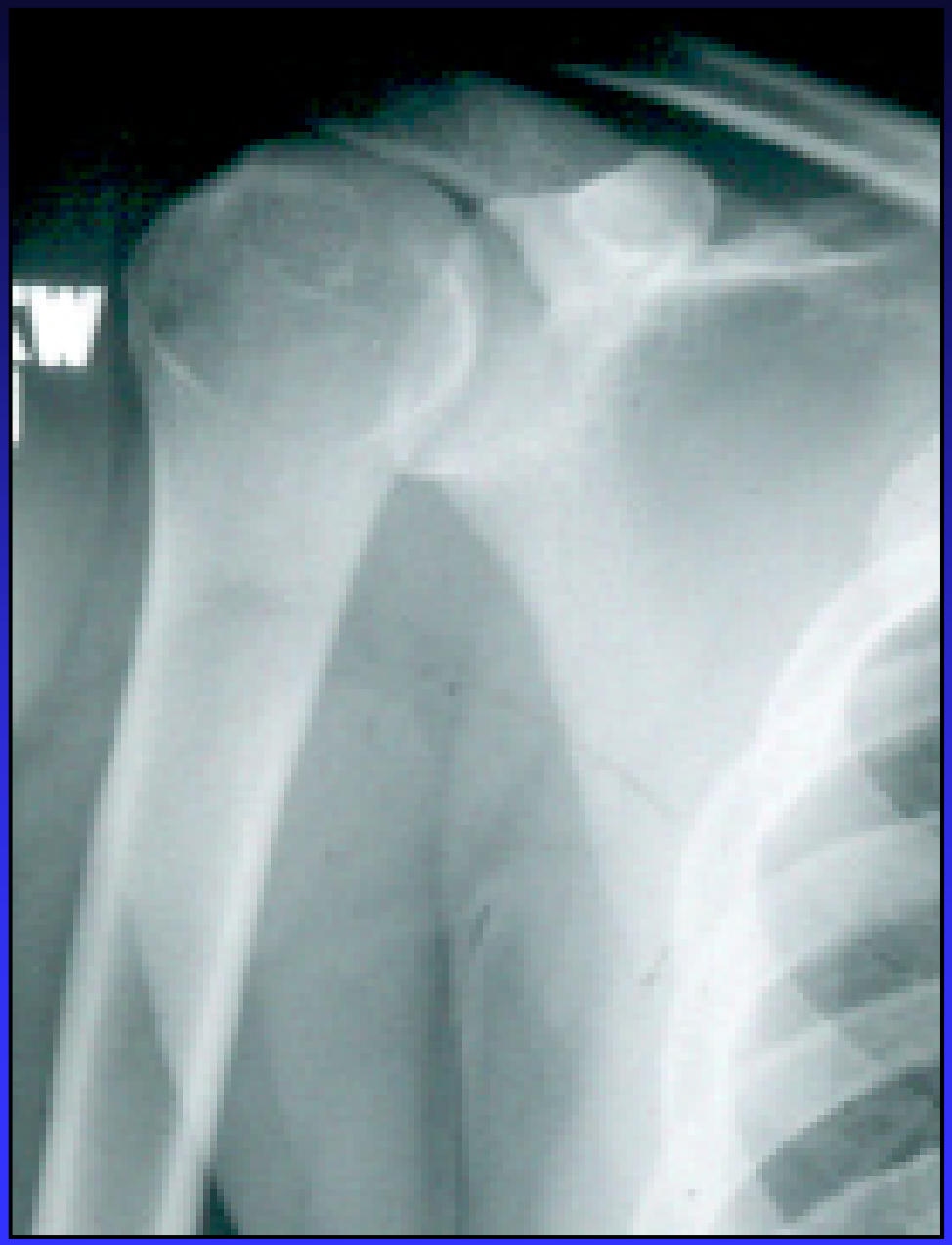
stability sitting

Examination

stability supine

Examination
radiographs

- AP, true AP
- Westpoint
- Axillary
- Outlet view
- Y view



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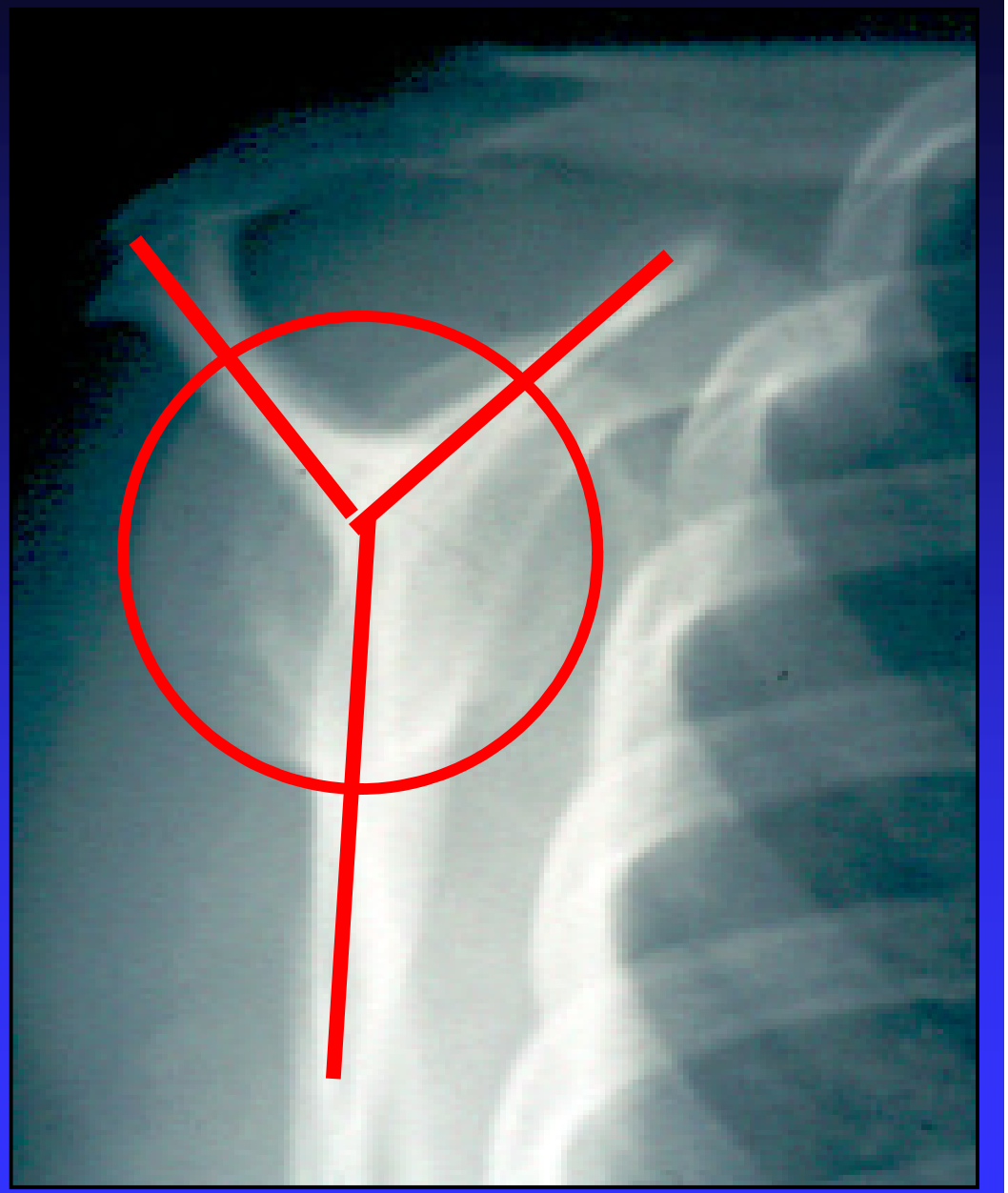
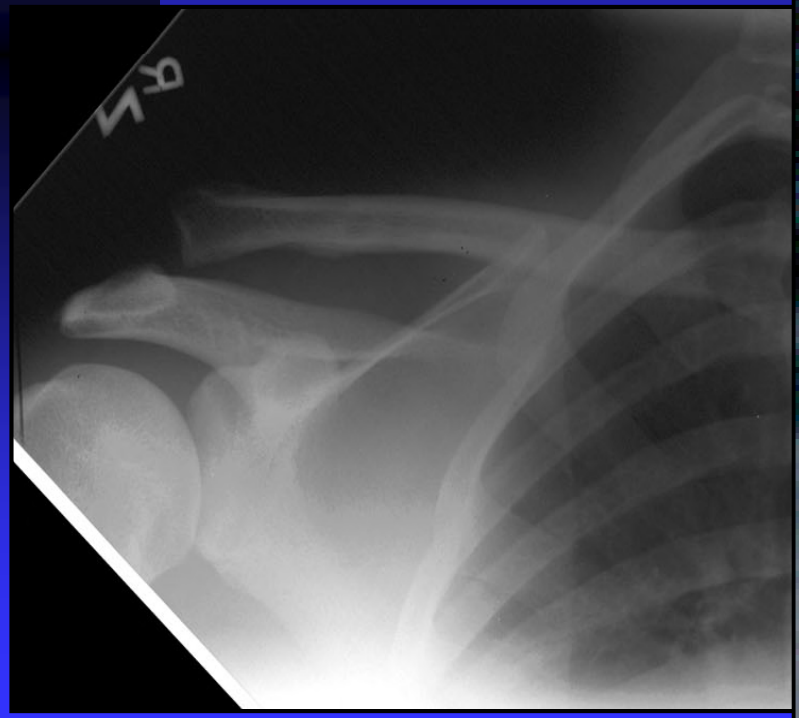
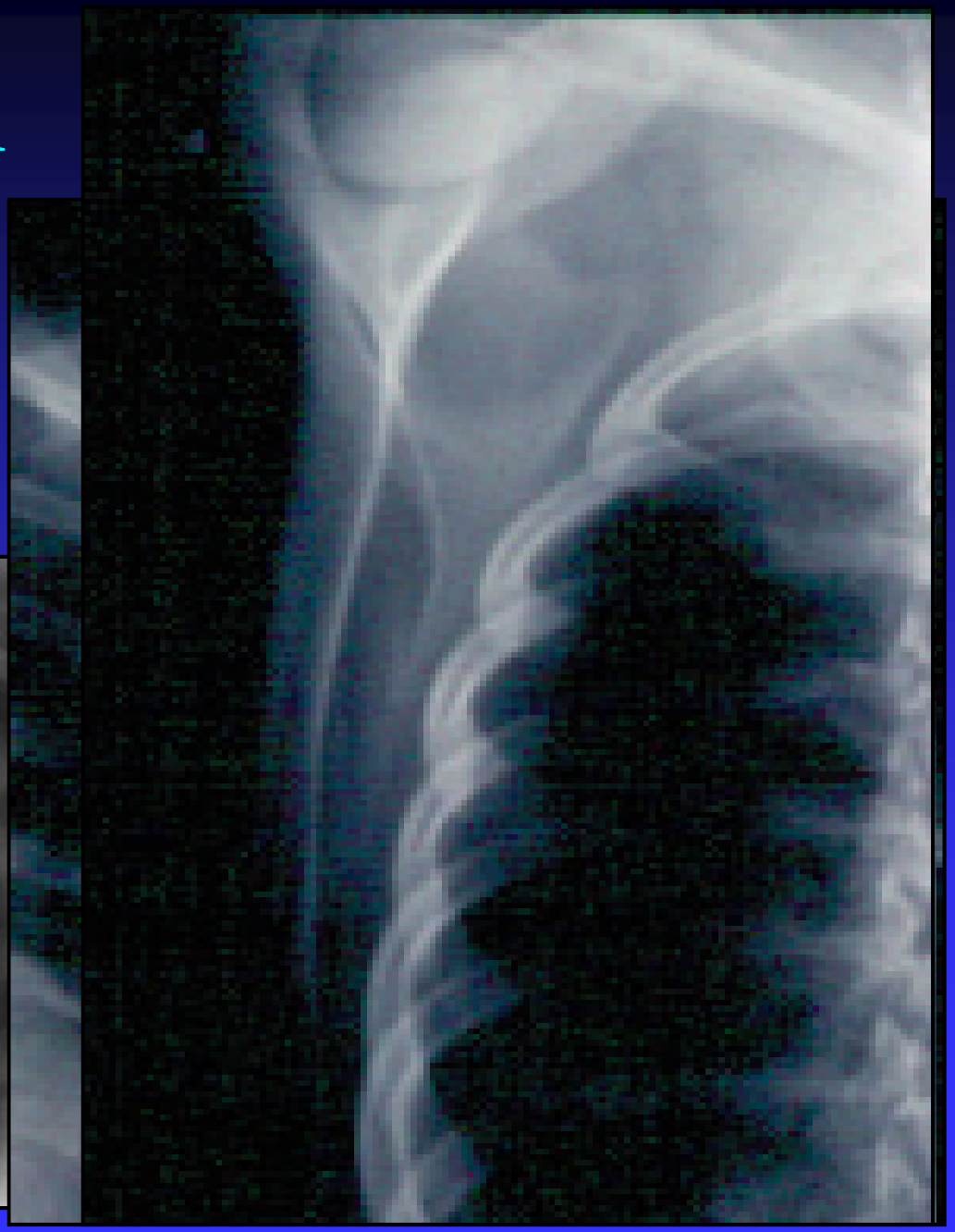


Examination
radiographs

- AC/SC joints
- Scapula





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Common Shoulder Disorders

- SC dislocation
- Clavicle fracture
- AC sprain
- AC osteolysis
- Impingement
- Instability
- Subluxation and dislocation
- Labral tear
- Bicipital tendinitis
- Adhesive capsulitis
- Referred pain

Common Shoulder Disorders

- SC dislocation
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- Referred pain

Sternoclavicular dislocation

- Only articulation between arm and axial skeleton
- 95% anterior
- Anterior = indirect force to PL or AL shoulder
- Posterior = direct blow to medial clavicle

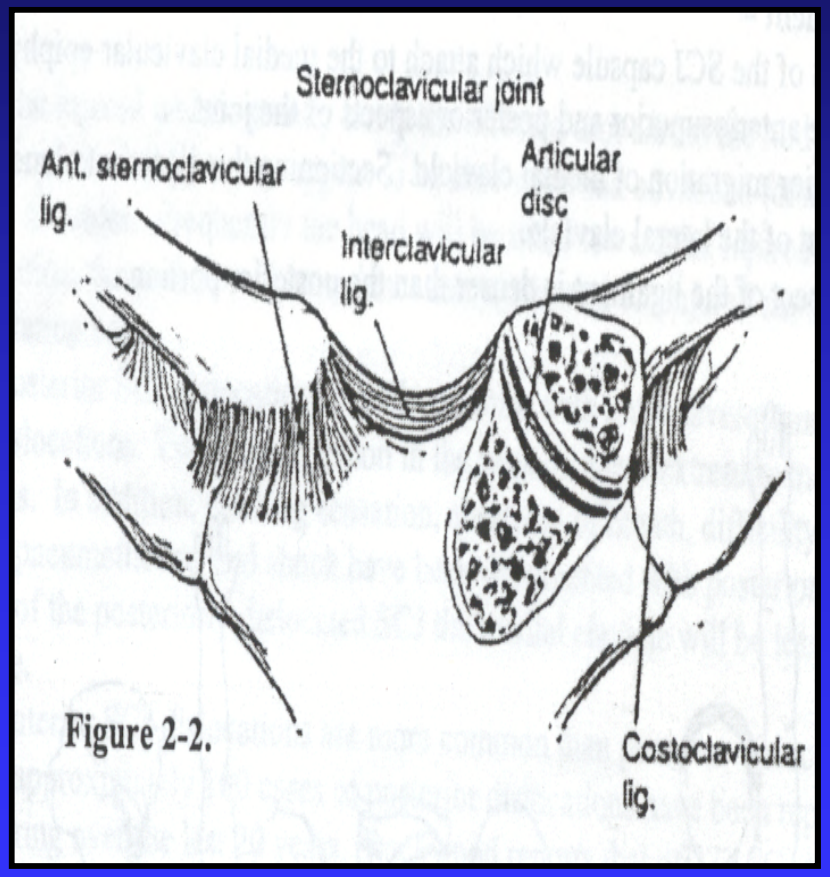
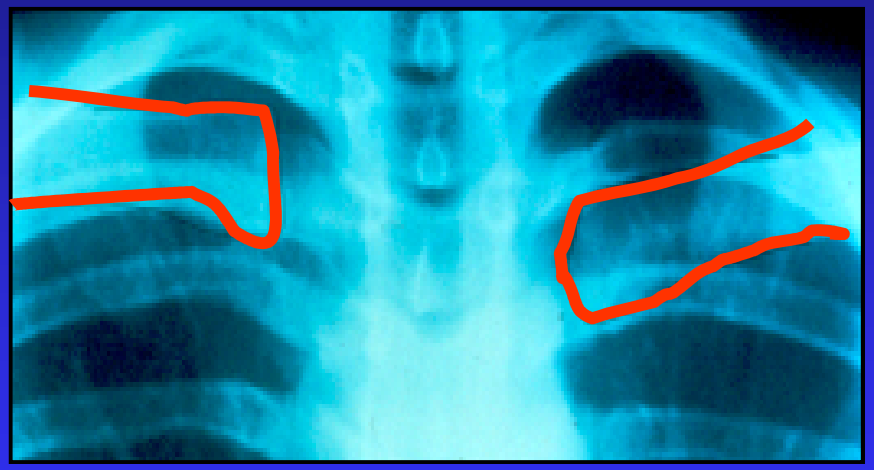


Figure 2-2.

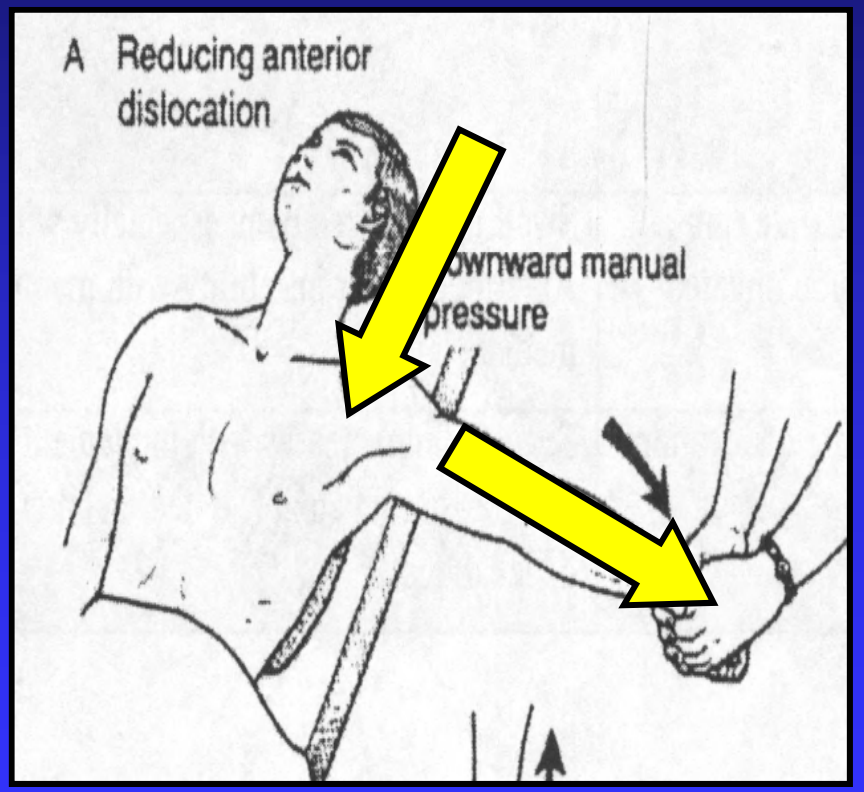
Sternoclavicular dislocation

- Only articulation between arm and axial skeleton
- 95% anterior
- Anterior = indirect force to PL or AL shoulder
- Posterior = direct blow to medial clavicle



Sternoclavicular dislocation

- Reduction
  - Anterior = Axial traction, downward pressure on clavicle
  - Posterior = Axial traction, upward pull
- Figure of 8, sling, ice, analgesics
- Injection



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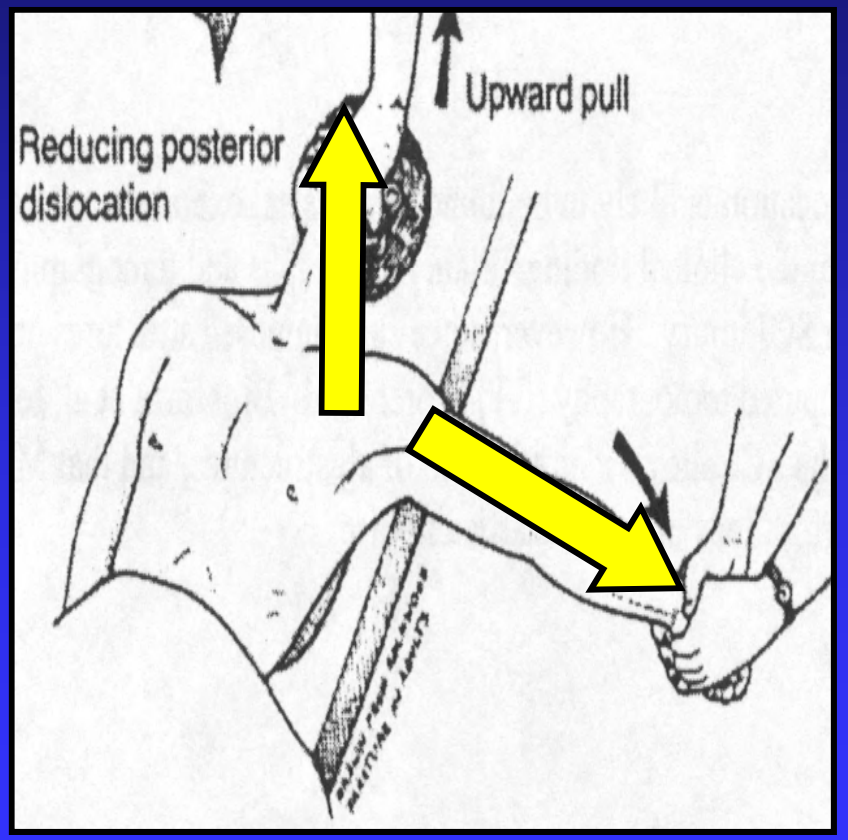


Common Shoulder Disorders

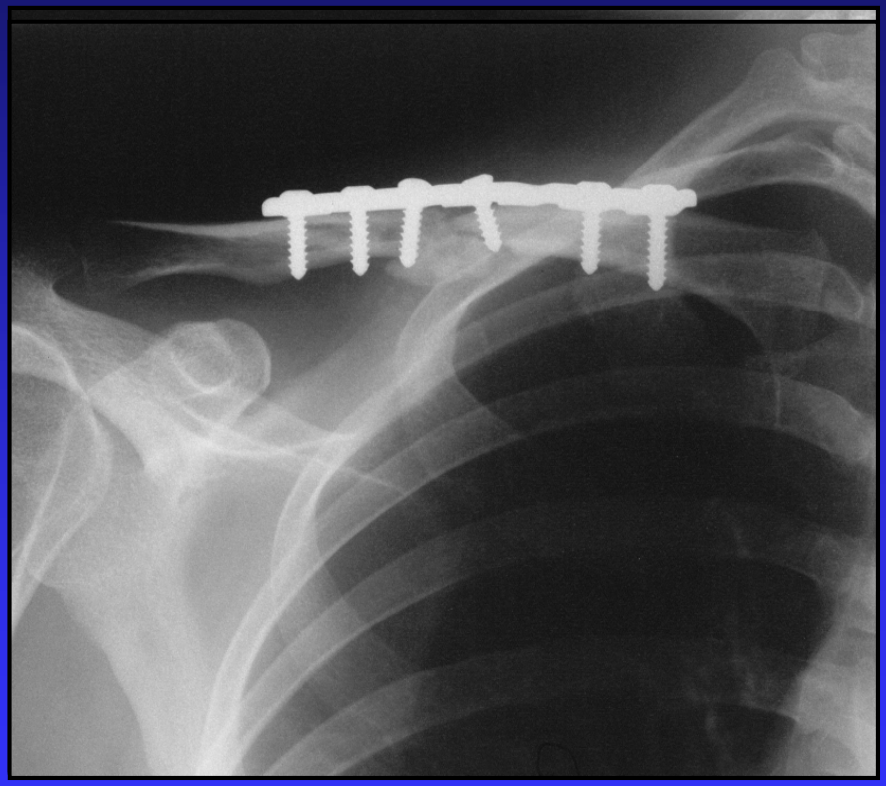
- SC dislocation
- Clavicle fracture
- AC sprain
- AC osteolysis
- Impingement
- Instability
- Subluxation and dislocation
- Labral tear
- Bicipital tendinitis
- Adhesive capsulitis
- Referred pain

Clavicle fracture

- Multiple classification systems
- 80% middle, 5% medial, 15% distal
- Fall on shoulder or outstretched arm, direct trauma
- Medial physis fuses at age 22-25

Clavicle fracture

- Figure of 8, shoulder immobilizer, exogen
- Displaced or distal may require operative fixation
- Rehab after period of immobilization
- Return to full activity in 4-12 weeks



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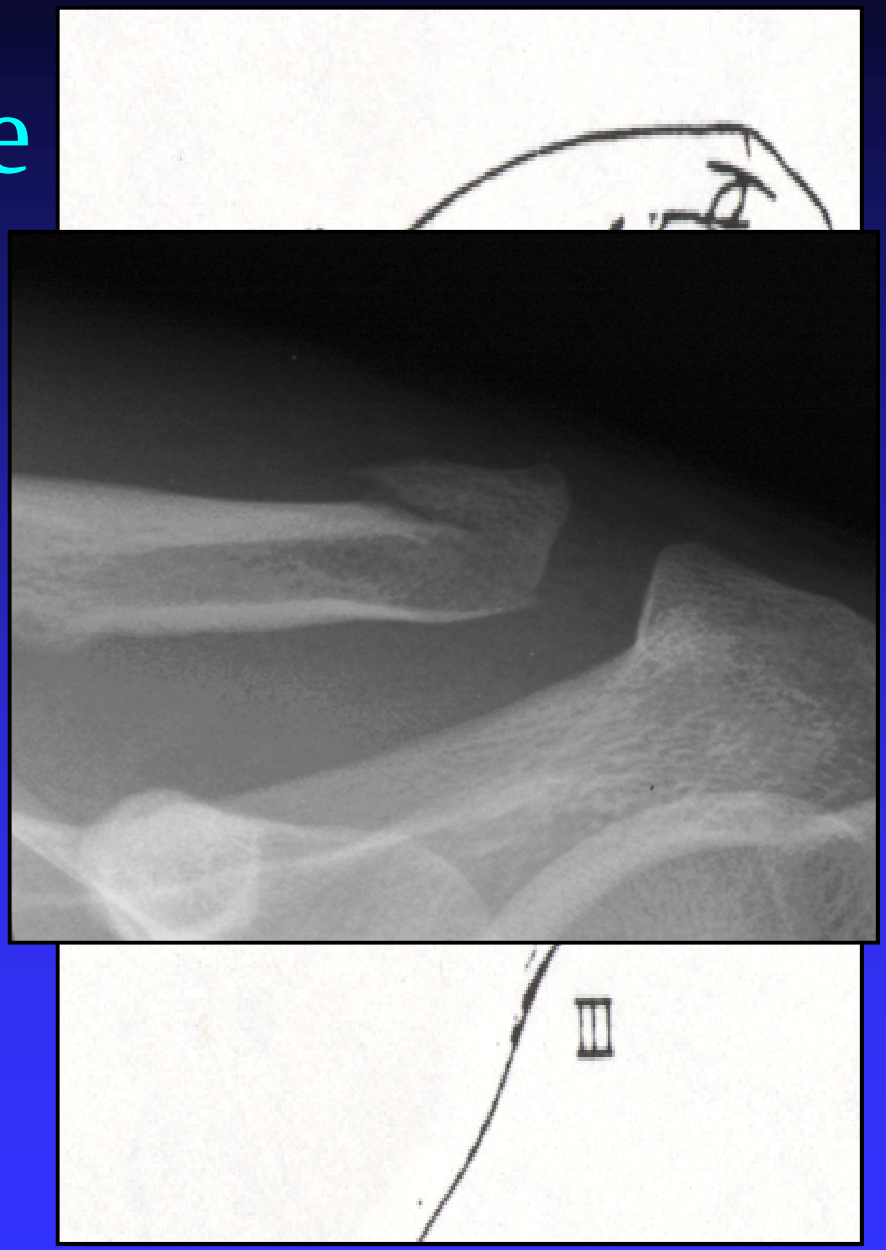

Common Shoulder Disorders

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- Adhesive capsulitis
- Referred pain

AC sprain

- 6 types, I, II, III most common in sports
- AC and CC (trapezoid/conoid) ligaments

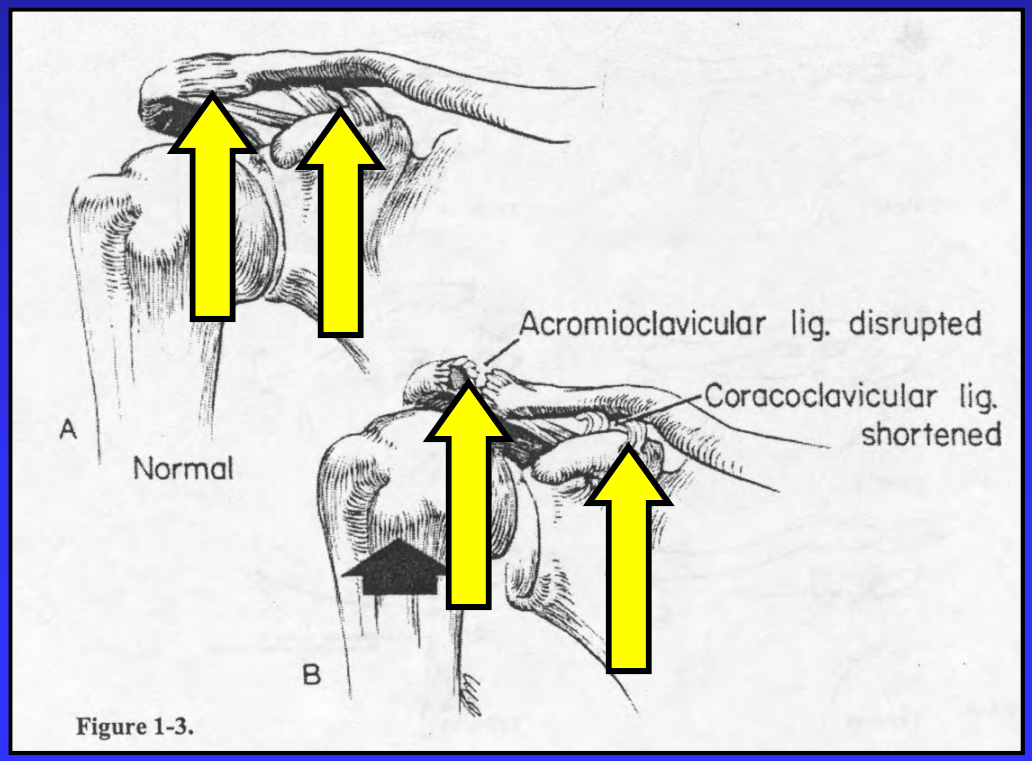
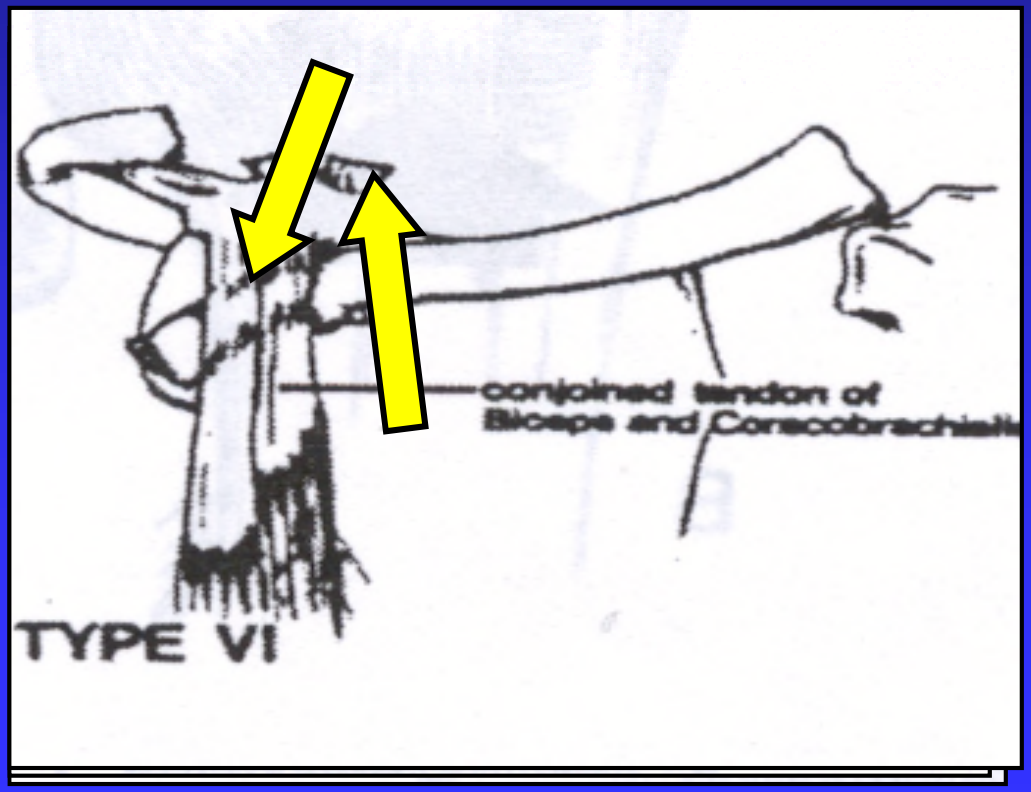


Figure 1-3.

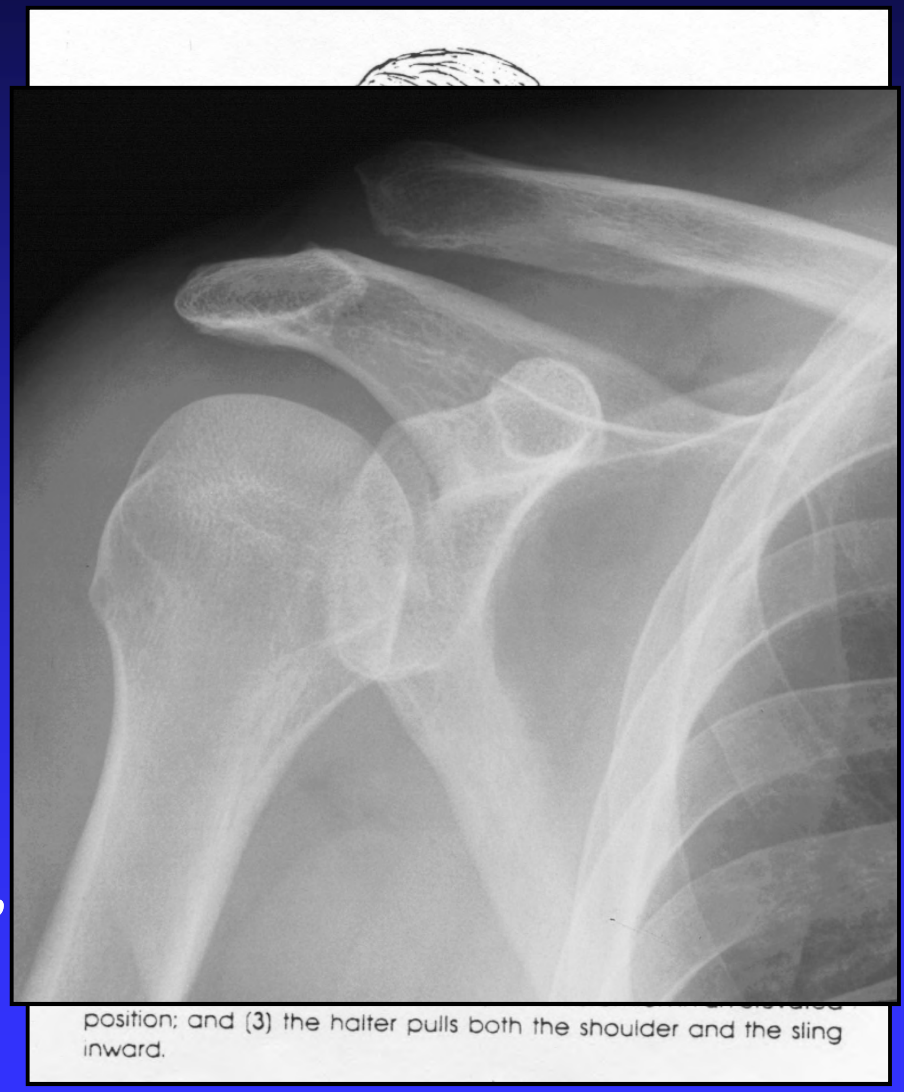
AC sprain

- 6 types, I, II, III most common in sports
- AC and CC (trapezoid/conoid) ligaments



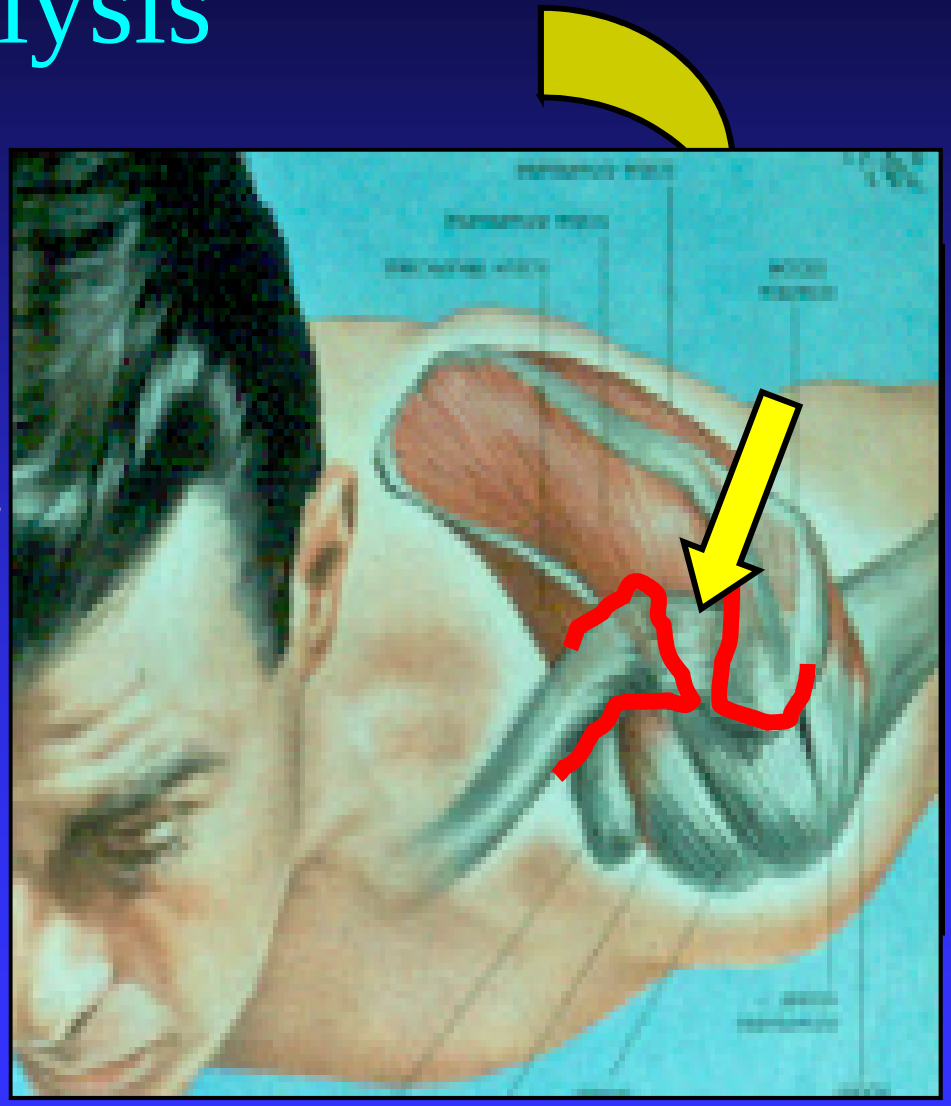
AC sprain

- Fall on point of adducted shoulder or outstretched hand, direct trauma
- Sling, ice, analgesics, strap, injection, Kenny-Howard sling
- Surgery for IV, V, VI, and maybe III



AC joint osteolysis

- Weightlifters
- Localized shoulder pain
- Swelling, deformity, tenderness
- Impingement signs
- Rest, ice, analgesics
- Injection
- Surgical excision



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- Subluxation and dislocation
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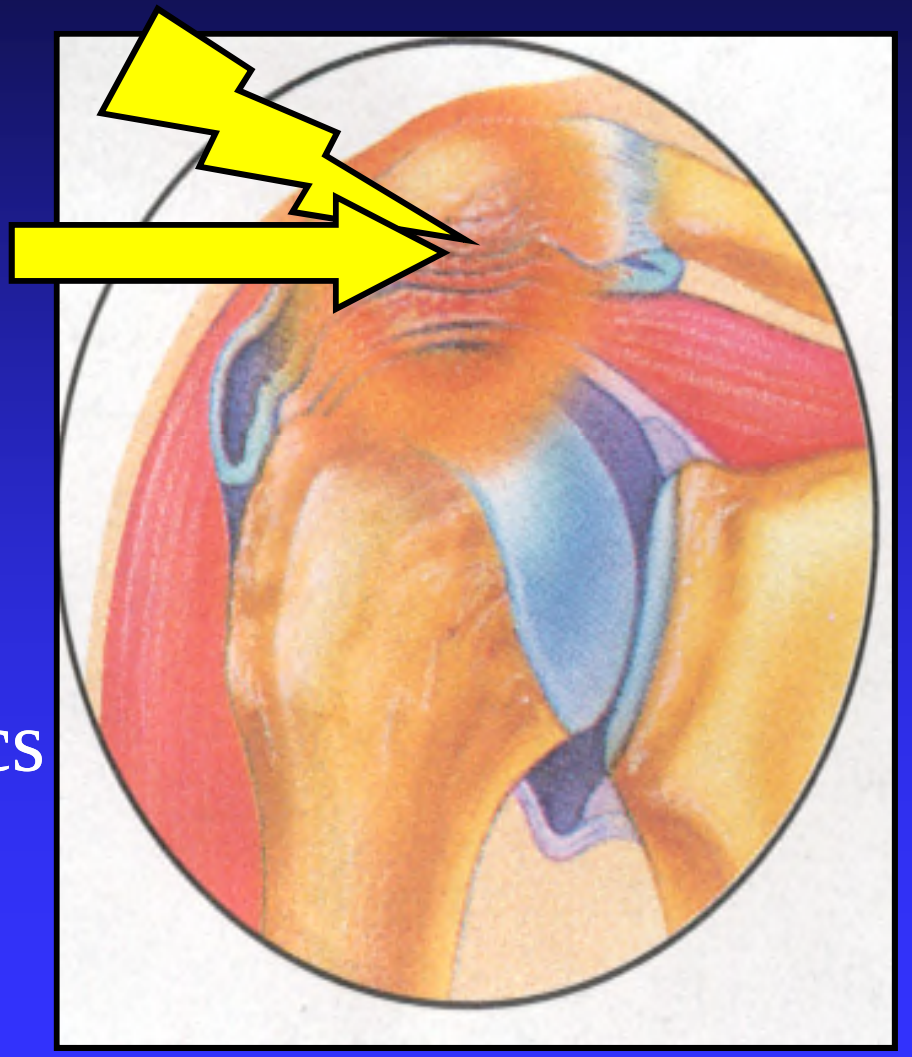
- Adhesive capsulitis
- Referred pain

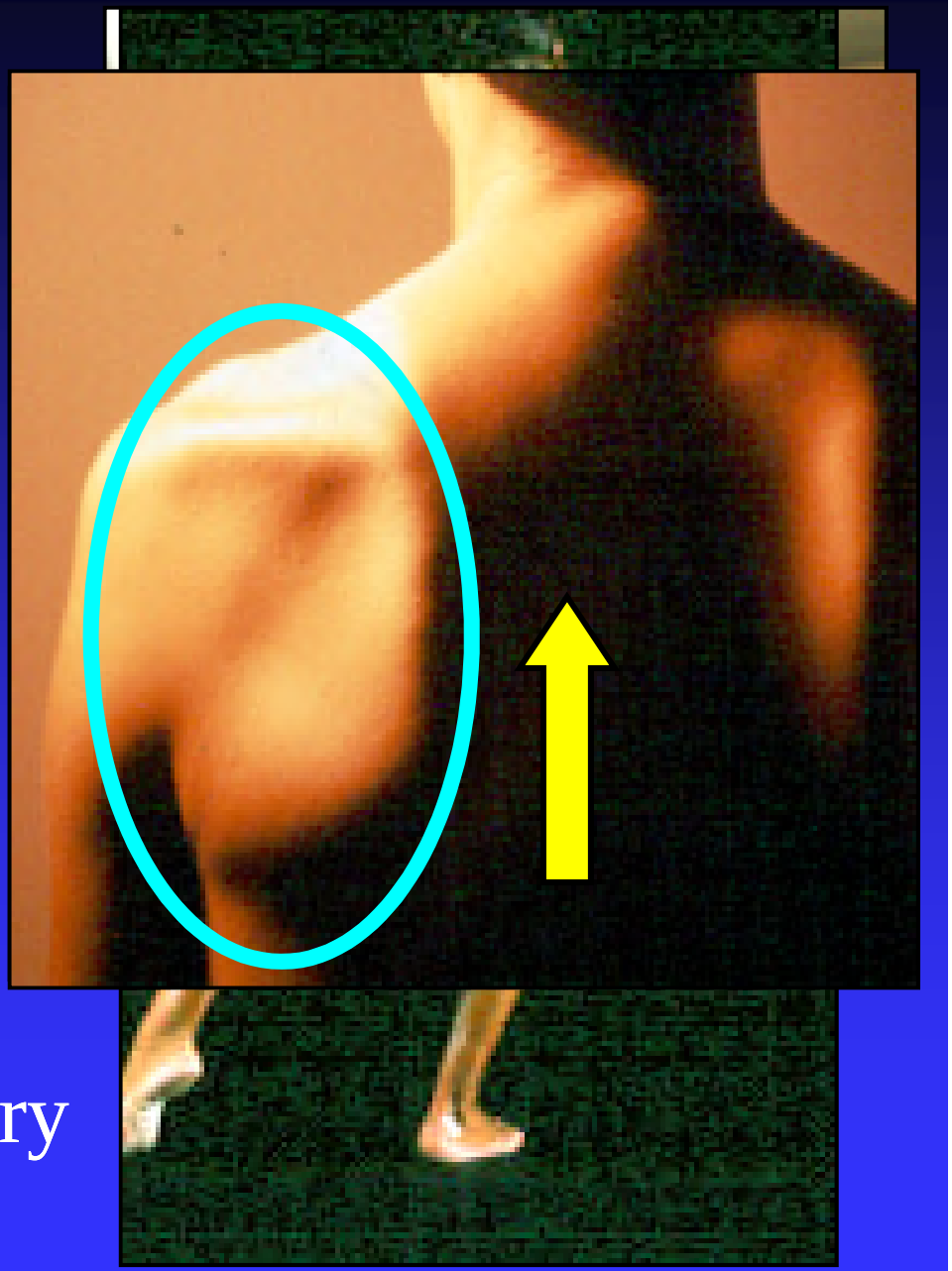
Impingement

- Beware of instability in younger athlete
- Positional pain, night pain
- Rest, ice, analgesics
- Rehab exercises



Impingement

- Kinetic chain
- Injections
- Modify activity
- Nerve entrapment
- MRI/msk US
- Beware RC tear
- May require surgery



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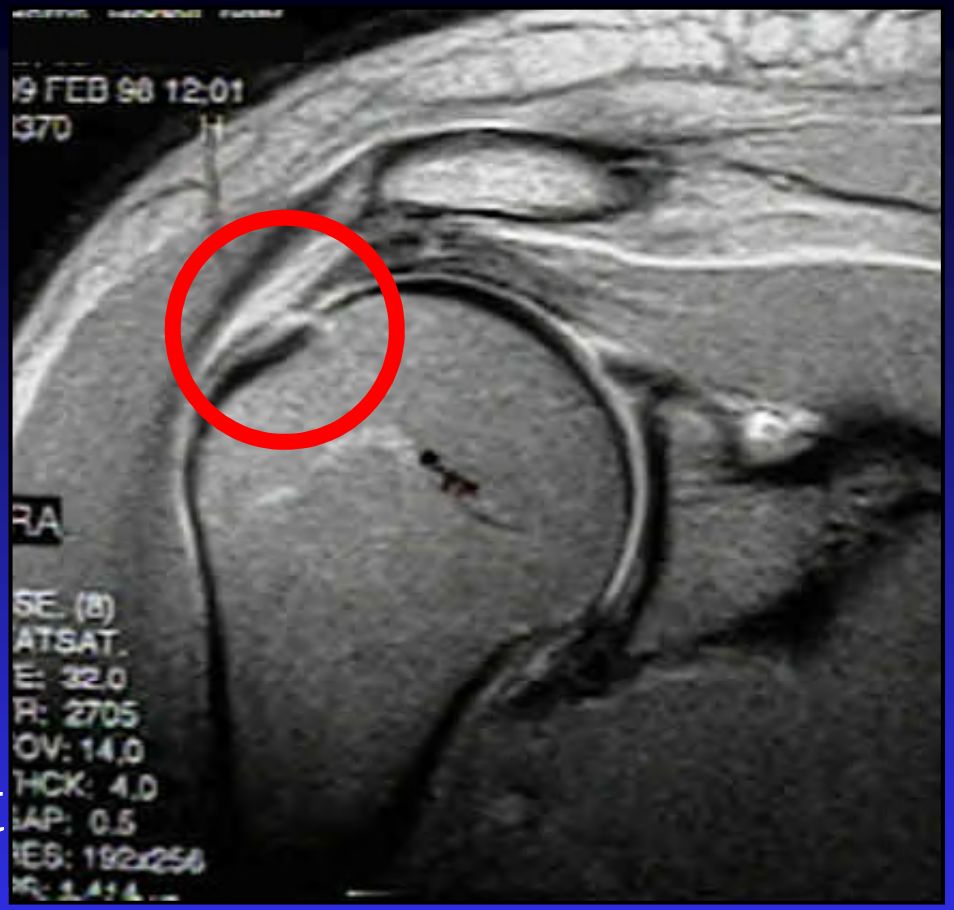

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Instability

- Anterior, posterior, inferior, MDI
- Pain during specific range of motion
- Dead arm
- Sulcus sign
- Apprehension

Instability

- Individualized treatment
  - severity of symptoms
  - direction(s)
  - age and activity level
  - etiology
  - timing

Instability

- Rest, ice, analgesics
- Rehab exercises
- Posture
- Brace
- Traumatic often need surgery
- Atraumatic may require surgery

Common Shoulder Disorders

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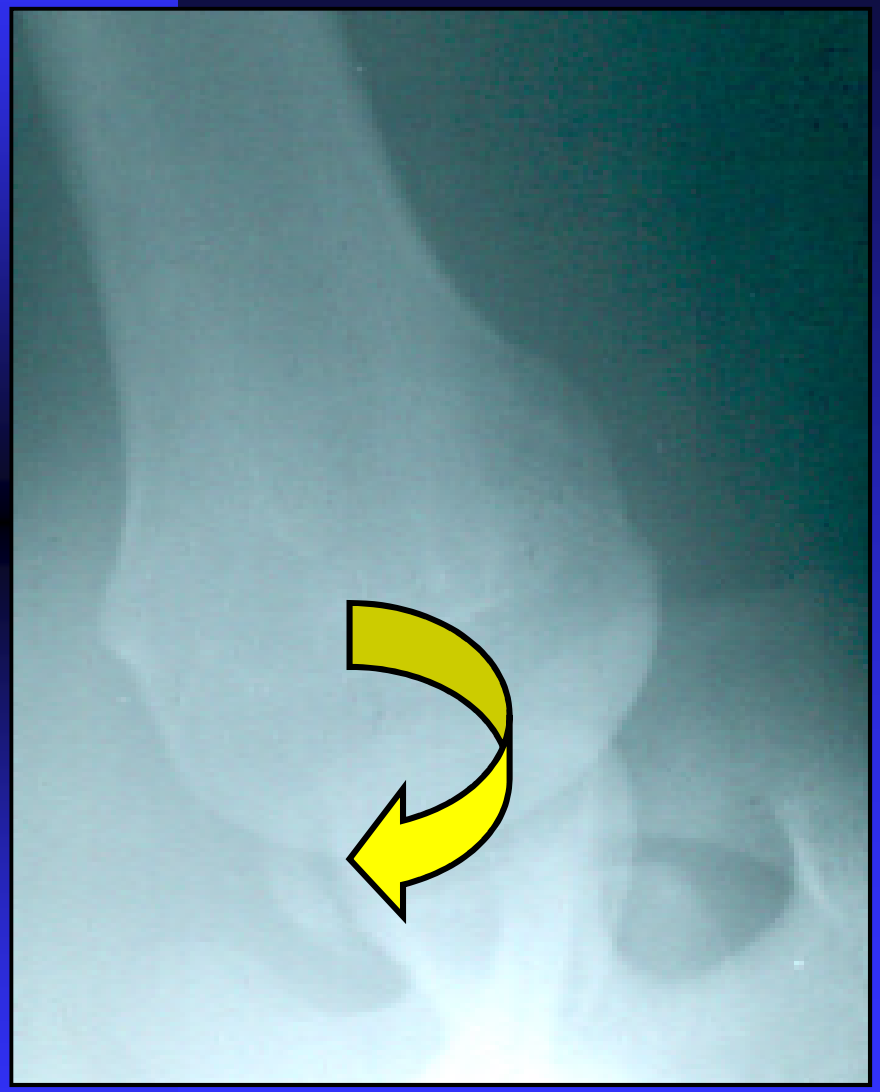
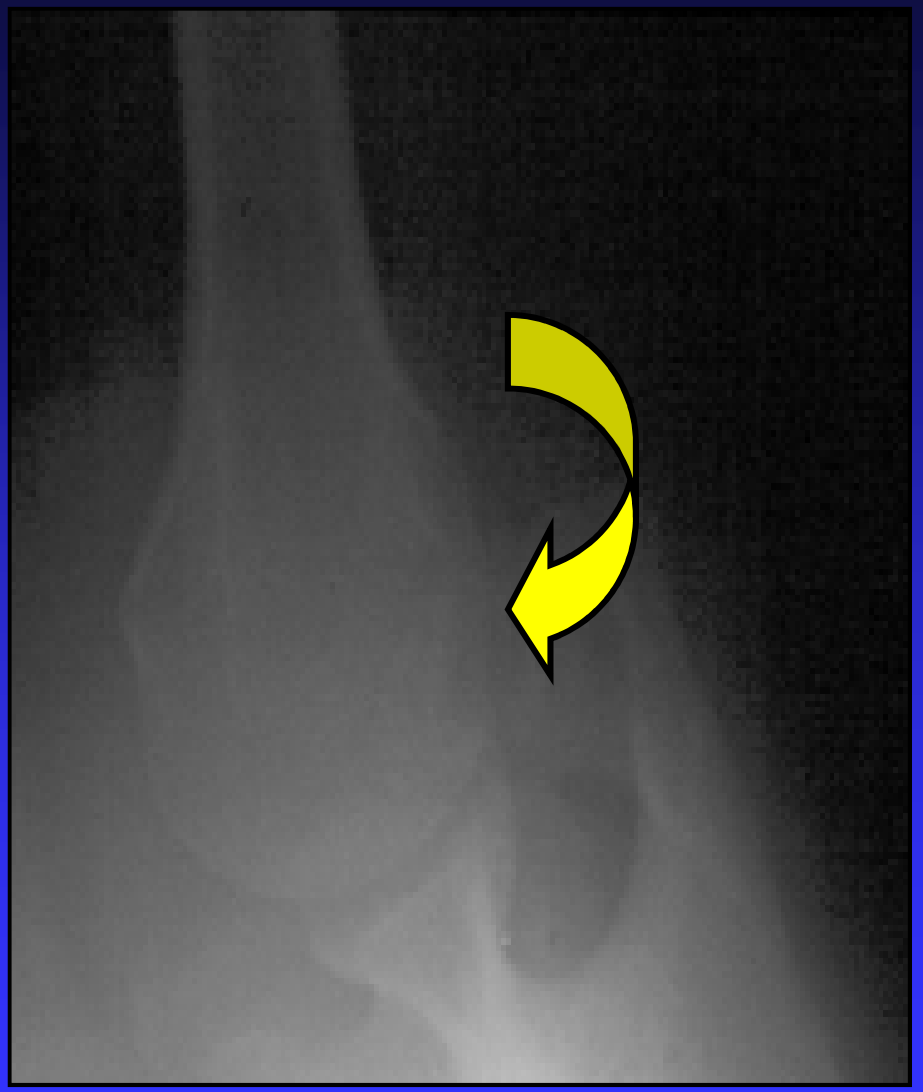
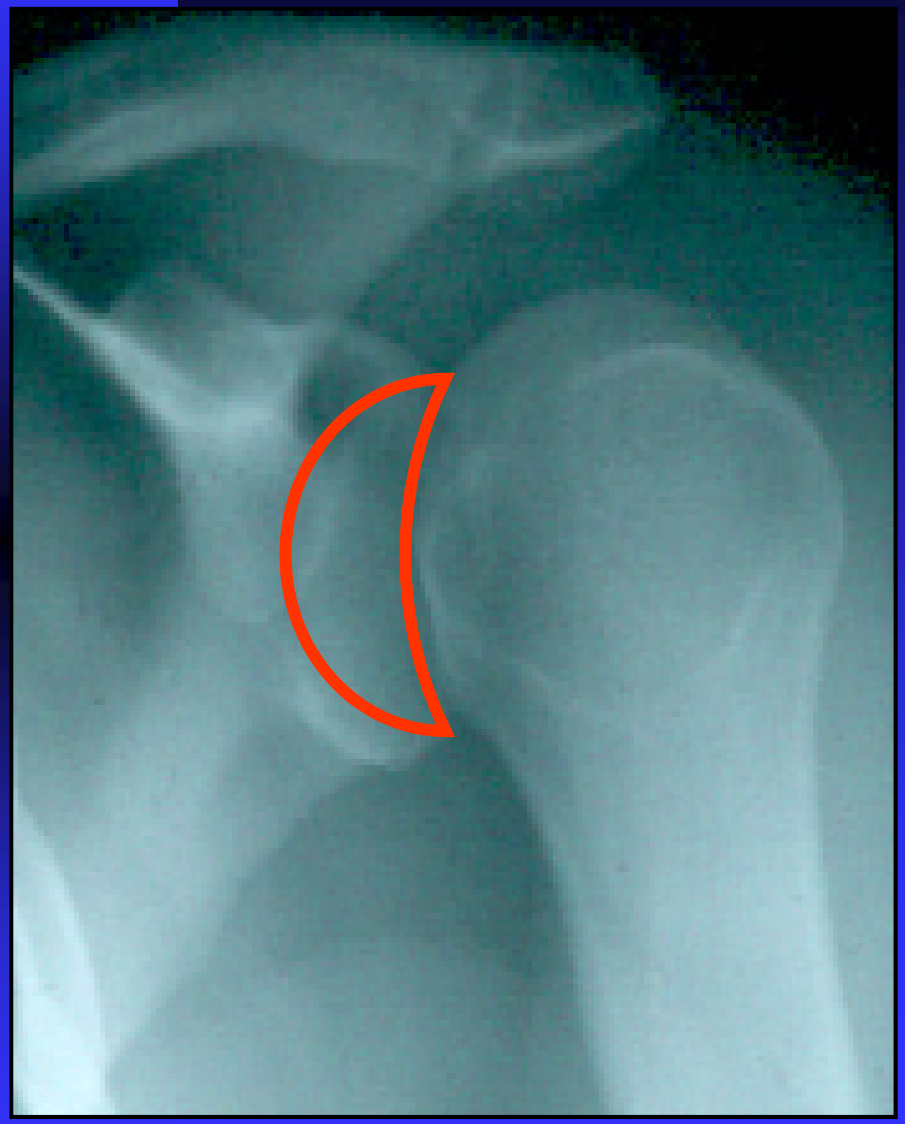
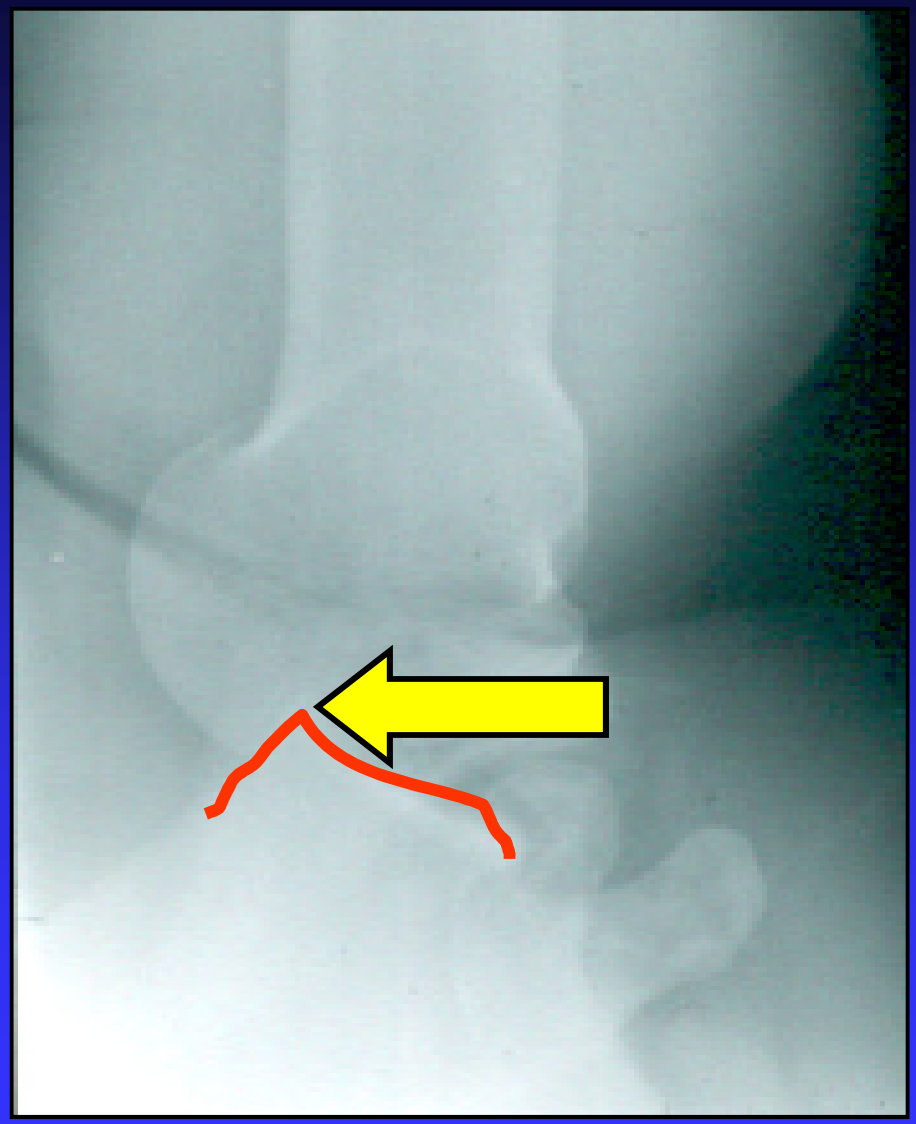
Subluxation and dislocation

- Check NV status
- Relocation
  - axial traction and ER for anterior
  - axial traction and IR for posterior
- Sling for comfort
- ER brace ***Itio, et al***





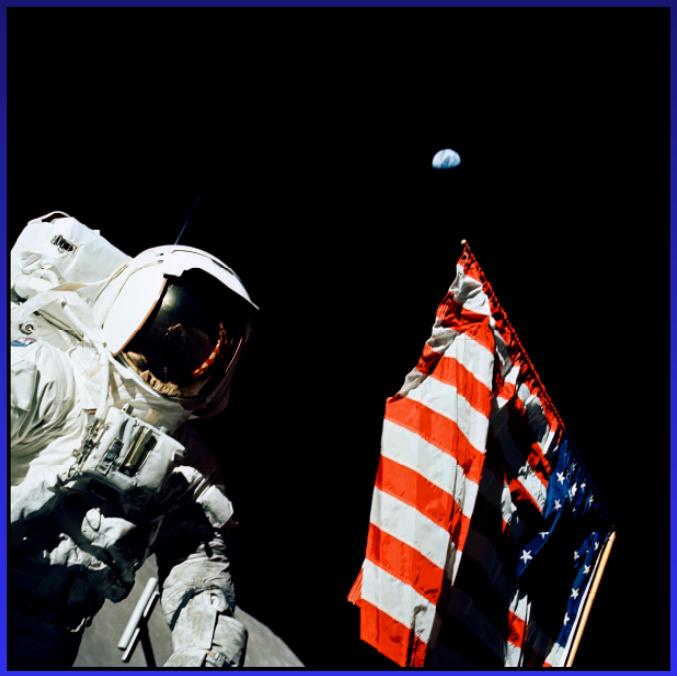




Subluxation and dislocation

Subluxation and dislocation

- Ice, analgesics
- Individualize treatment
- High recurrence rate < 20
- Rehabilitation exercises
- Brace
- Activity modification
- Often operate after first dislocation



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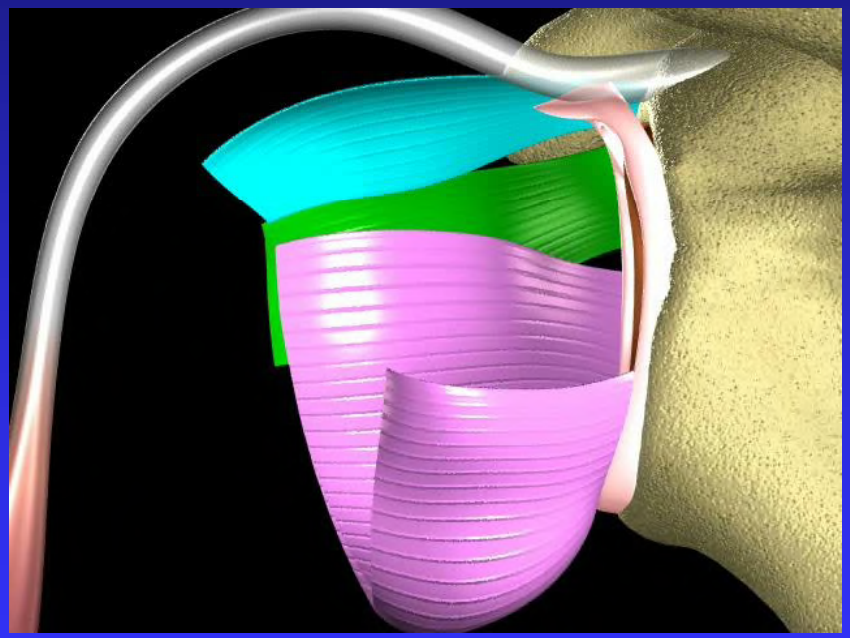
Labral tear

- Positional pain, pop, instability
- Throwers + lifters
- Impingement signs
- O'Brien's
- MR arthrogram
- Conservative vs Surgical treatment

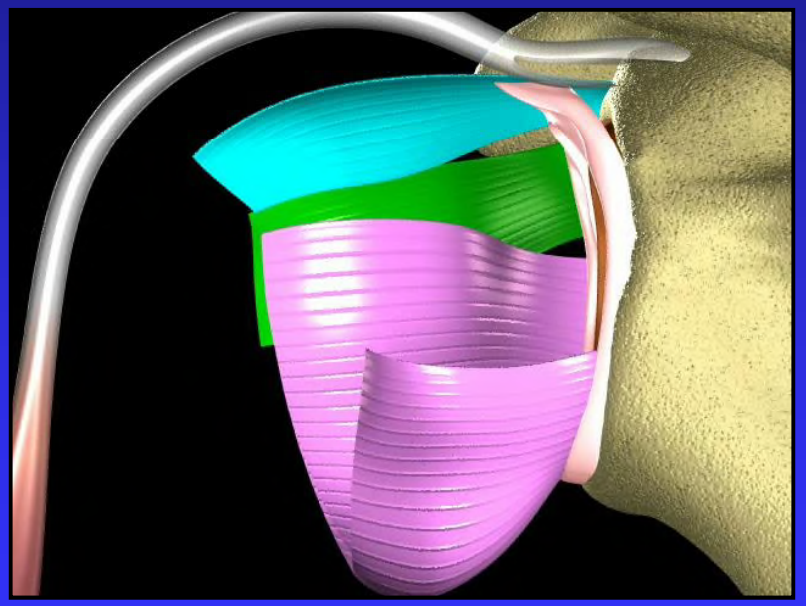
Type II



Labral tear

- Positional pain, pop, instability
- Throwers + lifters
- Impingement signs
- O'Brien's
- MR arthrogram
- Conservative vs Surgical treatment

Type IV



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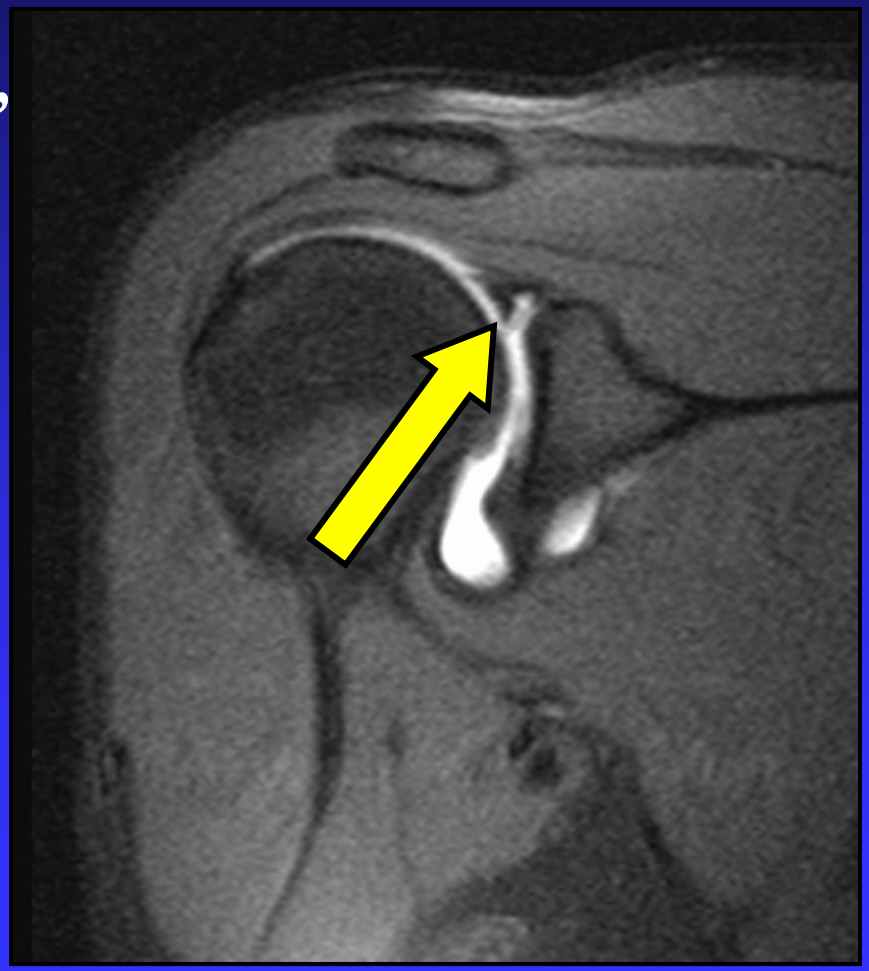
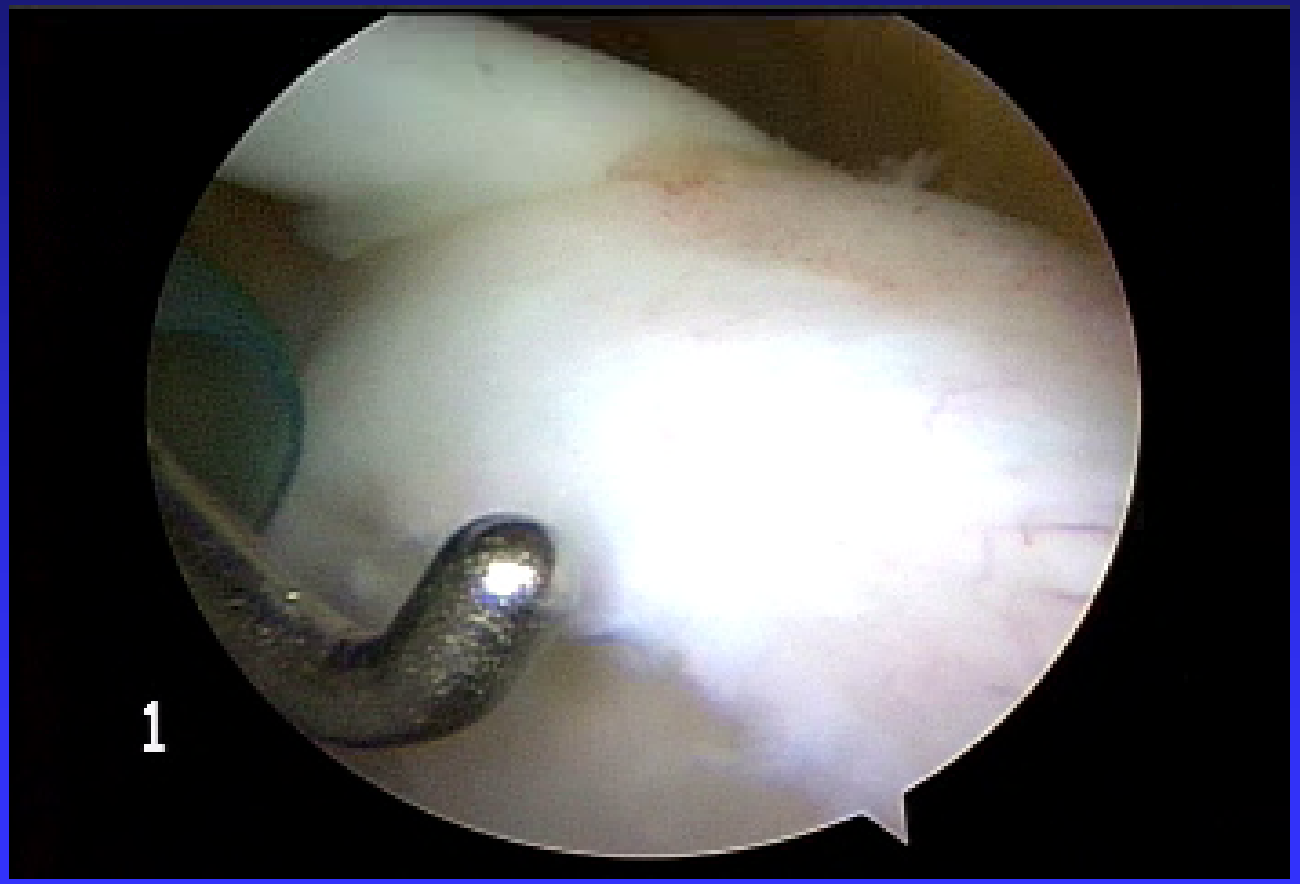


Labral tear



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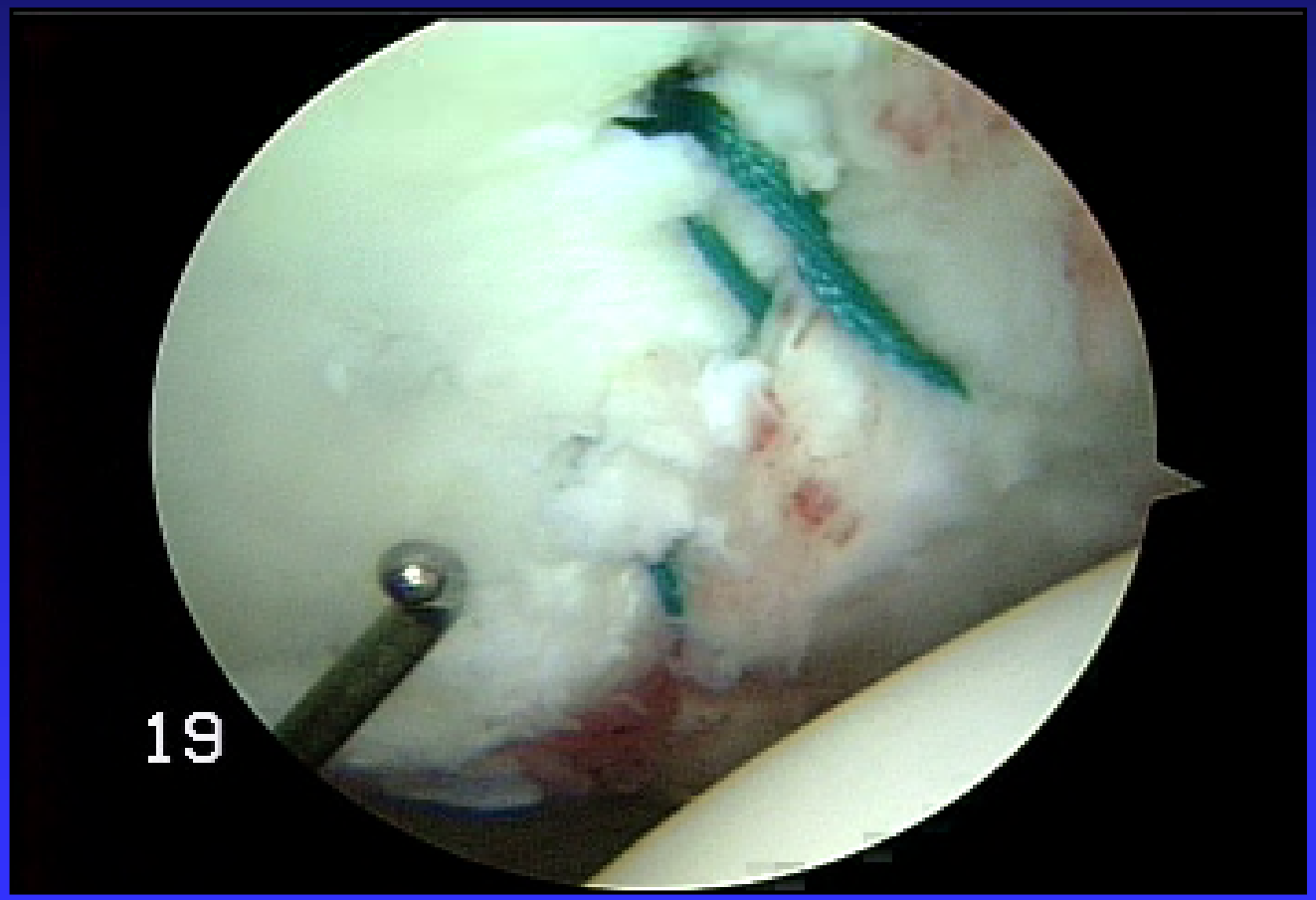

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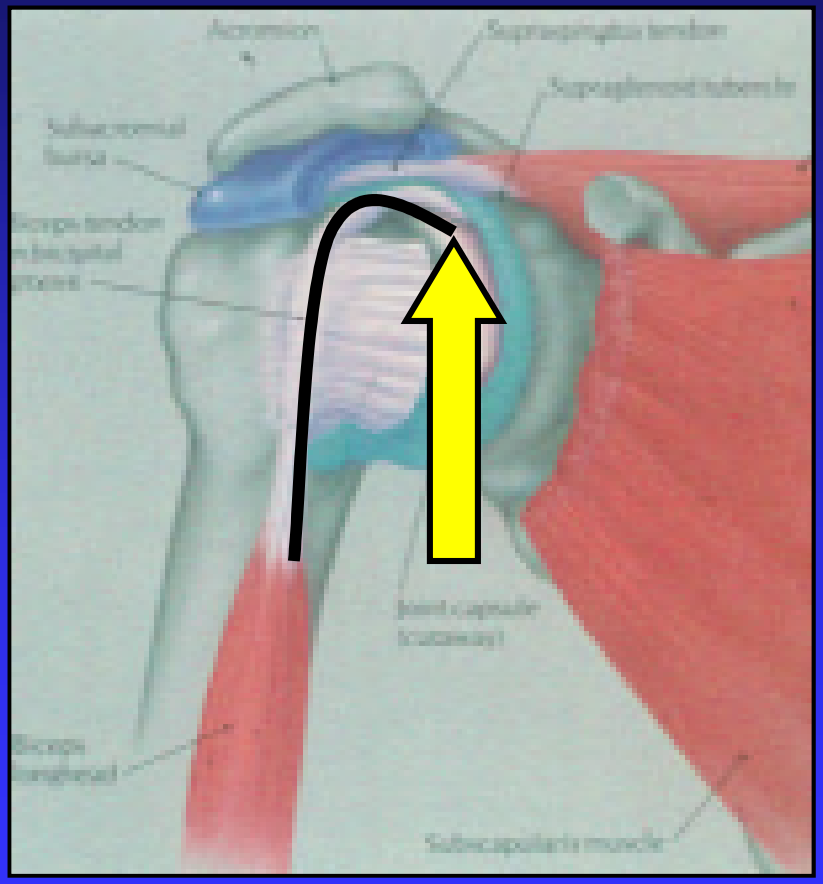
Bicipital tendinitis

- Anterior pain with flexion and supination
- Instability, SLAP, impingement
- Tender bicipital groove, + speed



Bicipital tendinitis

- Treat as impingement
- Modalities
- Injection
- Pain free after rupture

Common Shoulder Disorders

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Adhesive capsulitis

- 40-60 year old females
- May be traumatic or atraumatic
- Pain, freeze, thaw
- Loss of active and passive motion

Adhesive capsulitis

- May have severe, mild, or no pain
- Moist heat
- Modalities
- Analgesics
- ROM exercises
- PRE

Adhesive capsulitis

- Cortisone injection in inflammatory phase
- High volume arthrogram
- Manipulation
- Educate patient
- Be patient

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Referred pain

- Cervical
- Upper extremity
- Brachial plexus
- Cardiac disease
- Pulmonary disease
- GI, diaphragmatic
- Splenic
- Malignancies

Thank You